ELECTRICAL REVIEW

Vol. CXLVII 14th JULY 1950 No. 3790

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EDITORIAL, ADVERTISING & PUBLISHING OFFICES: Dorset House, Stamford St., London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No.: Waterloo 3333 (60 lines). Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £3 6s. 0d.; U.S.A. and Canada $11.00. Cheques & P.Os. (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

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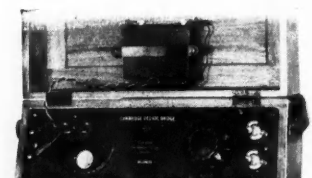

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ELECTRICAL REVIEW

Vol. CXLVII No. 3790 14TH JULY, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

Power Resources

THIS WEEK'S CONFERENCE IN LONDON

MANY aspects of almost all practical means of producing power have been touched upon in the discussions on the 156 papers submitted to the World Power Conference in London this week. Nearly 1,600 members and delegates attended from 47 countries.

Several unusual features distinguish this Conference. It is one of the very few international engineering organizations—probably the only one—with permanent headquarters in London. There is no individual membership. Participation is through permanent National Committees (in forty-one countries at present) which are represented in the International Executive Council and all papers have to be submitted through those Committees.

Inception of Conference

We clearly remember attending the first plenary session at the Wembley Exhibition in 1924 and the return to London after twenty-six years has been welcome. It is quite remarkable that the W.P.C. has gone on with increasing success through the intervening quarter-century without having to change its constitution in any major respect.

There could not be a more fitting memorial to its founder and driving force (D. N. Dunlop—1924 to 1935), the first organizing secretary (later director) of the B.E.A.M.A. and a founder of the E.R.A. and the E.D.A. He foresaw the great benefit that can come from the co-operation of scientists with engineers, nationally and internationally, pooling their knowledge of the world's resources of energy for the most advantageous use of power in the service of mankind.

The W.P.C. was one of the first technical non-governmental organizations to be accorded consultative status by the Economic and Social Council of the United Nations and it has been given the same status by UNESCO which, incidentally, has chosen "Energy in the Service of Man" as the theme of its discussion next year.

Development Since 1924

The first instalment of our serial account of this week's meeting, which will be found on another page, covers the reports sent in by twenty-six countries on their indigenous energy resources. This massive meal offered for digestion at the session concerned with energy resources and power development since 1924 has come from countries which, together, represent almost one-third of the world's area and nearly one-half of its population. They form as concisely comprehensive an expression of views as would seem practicable in the prevailing economic and political circumstances of the world.

Since the whole had been conceived on a regional basis, country by country, it is much the best plan, we think, to keep this reality in mind when endeavouring to assess the chief facts which emerge from these reports, which may perhaps

be best surveyed on a geographical basis.

We have therefore dealt in this issue with groups of countries throughout rather than with subjects. The rest of the material for the instalments to follow, however, will not be summarized in this way, but rather on a subject basis, of which there are several.

TRANSMISSION—NEXT STAGE

While advanced experiments on transmission at very high voltages are being conducted in several countries, including our own, it was the Swedish achievement in this way that attracted most attention at C.I.G.R.E. last week. That is the reward of the enterprise of the Power Board in putting in hand the first 380 kV scheme. The Government of that country is to be commended also for providing facilities for engineers from elsewhere to see the work for themselves. Conditions in Great Britain may not make the use of such voltages imperative here within the next fifteen to twenty years, but it was encouraging to learn at the Paris conference that the B.E.A. has in mind the construction of sections of the grid to operate at 380 kV, which will enable British engineers to demonstrate their capabilities.

220 kV CABLES

The grid has in the past provided excellent opportunities for testing 132 kV cables and apparatus under working conditions, but British manufacturers have on many occasions in recent years proved their abilities to build for much higher voltages. The opportunity provided by Electricité de France to install two types of British cable in series with the Paris 220 kV network is most acceptable as a means of demonstrating how they stand up to ordinary load cycles and the experience thus gained will no doubt be valuable. It would, however, be more convenient and certainly more impressive internationally if tests of this kind could be carried out at home.

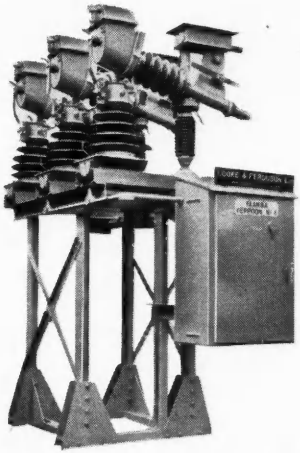
HIGHLAND PLAN

It is appropriate that the Scottish Home Department's White Paper on developing the Highlands should appear almost at the same time as the North of Scotland Hydro-Electric Board's report, for electricity is the key to the plan. Last year alone capital expenditure by the Board amounted to £13.4 million, making a total of nearly £33 million. Indications are not lacking of the desire of the inhabitants for the modern amenities which electricity makes available. In parts of the West Highlands and the Islands, for instance, the proportion of domestic consumers who already have electric cookers varies from 30 per cent to as much as 57 per cent. Opposition to hydro-electric development schemes has become negligible; in fact, from the remote county of Sutherland there recently emanated a vigorous complaint that "instead of electric power pulsating through the glens to process dolomite, limestone and peat, they are recommended as a special wild-life conservation area." If the Board helps to halt the flow of population southwards, it will itself be better able to provide supply extensions on an economic basis.

INCENTIVE SCHEMES

In the opinion of both employers and employees in the electrical contracting industry the institution of incentive schemes as a means of stimulating "production" in the industry is not possible. We have been inclined to agree with this view, but our conviction is shaken by the fact, reported in this issue by Mr. J. Mortimer Hawkins, that such schemes are in successful operation in Sweden. It is evident that a proper frame of mind is essential to make incentive systems work. This appears to exist in Sweden, but are relationships between the National Federated Electrical Association and the Electrical Trades Union of such a character as to make the introduction of payment by results feasible here? It would be interesting to have some individual, as opposed to "official," views on this.

Particulars of the careers and positions of about 2,600 leading men and women in all branches of the industry are contained in the "Electrical Who's Who" obtainable from *Electrical Review*, Dorset House, Stamford Street, S.E.1, or booksellers, price 12s. 6d. (postage 7d.).



Type OE6 minimum-oil outdoor circuit-breaker, ratings up to 1,500 MVA at 33/44 kV, and (below) type UD single busbar, air-insulated switch unit rated up to 1,200 A, 350 MVA, 11kV

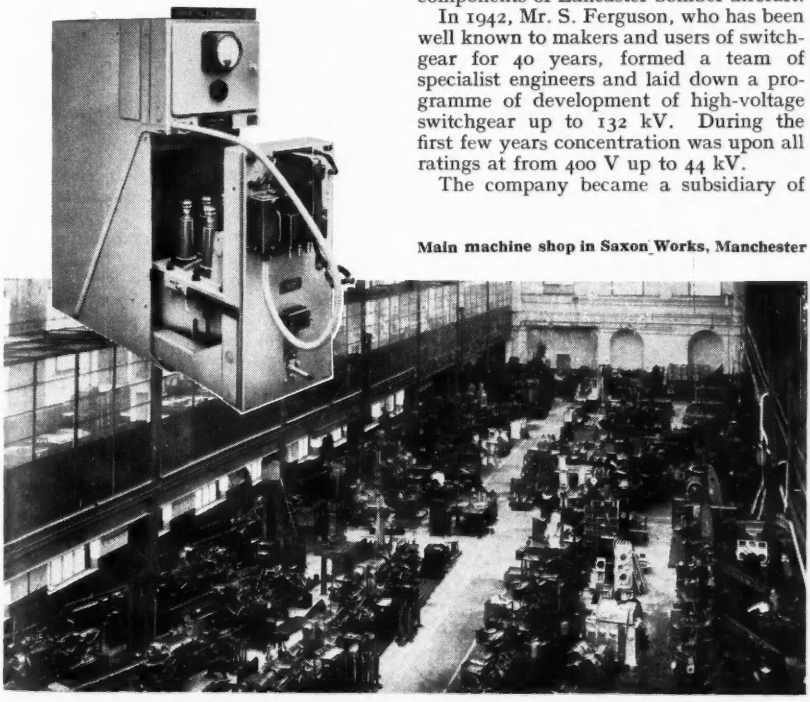
High-voltage Switchgear

Recent Developments in British Manufacture

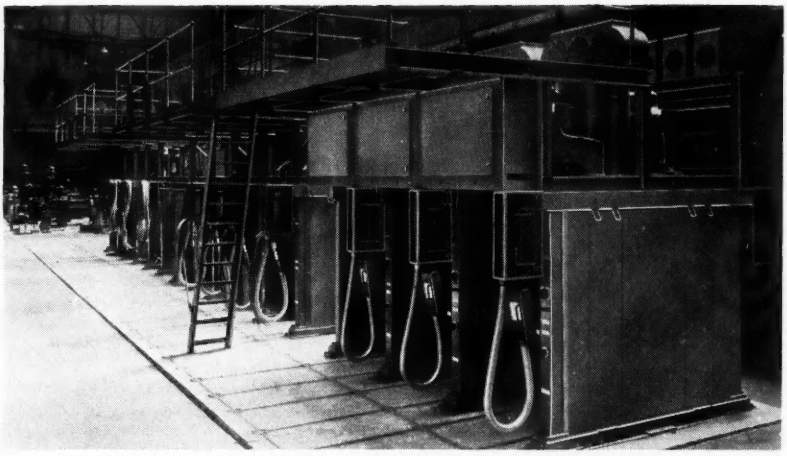
FOUNDED thirteen years ago as a general engineering concern, Cooke & Ferguson, Ltd., were engaged until 1945 on war contracts, which included destroyer low-pressure turbine cylinders, reduction drive gear cases, condensers for the Admiralty, and major components of Lancaster bomber aircraft.

In 1942, Mr. S. Ferguson, who has been well known to makers and users of switchgear for 40 years, formed a team of specialist engineers and laid down a programme of development of high-voltage switchgear up to 132 kV. During the first few years concentration was upon all ratings at from 400 V up to 44 kV.

The company became a subsidiary of



Main machine shop in Saxon Works, Manchester



Assembly bay for 33 kV metal-clad switchgear

Crompton Parkinson, Ltd., in October, 1947, since when a further effort has led to important developments at higher voltages.

Some seven hundred people are employed in two distinct factories; the Saxon Works of 60,000 sq ft area, for the primary production functions of the machine shop and the welding shop, and the Victoria Works, of 90,000 sq ft, engaged entirely on the assembly of high-voltage switchgear. In both works the main bays are served by 5-ton and 10-ton overhead cranes to facilitate the assembly of heavy metal-clad units. Modern machine tools, with a high degree of tooling, ensure the accuracy necessary for interchangeability of the products.

The development and research sections have been kept in close step with the improvement in production facilities so that a range extending from 400 V industrial oil circuit-breakers to 66 kV outdoor equipment has been put into routine production. The main guiding principles included simplicity of design and economy of manufacture, particularly with regard to standardization and interchangeability of components, as demonstrated in the first unit to be marketed (type UD air-insulated switch) which embraced 43 B.S. ratings in the one frame size from 50 MVA at 3.3 kV to 350 MVA at 11 kV. This was quickly followed by an oil/compound-filled unit of equivalent ratings. As an extension to existing practice air-insulated metal-clad units have been produced, both in the single and duplicate busbar forms, rated up to 350 MVA at 6.6 kV and 500 MVA at 11 kV, with comparable filled metal-clad units increasing in range to 500 MVA at 6.6 kV and 750 MVA at 11 kV.

The latest addition to the indoor metal-clad range, now in production after exhaustive development and proving tests, is the type FTE5 phase-segregated 33 kV metal-clad gear, which is available in either the single or duplicate busbar form with breaking capacities of up to 1,000 MVA.

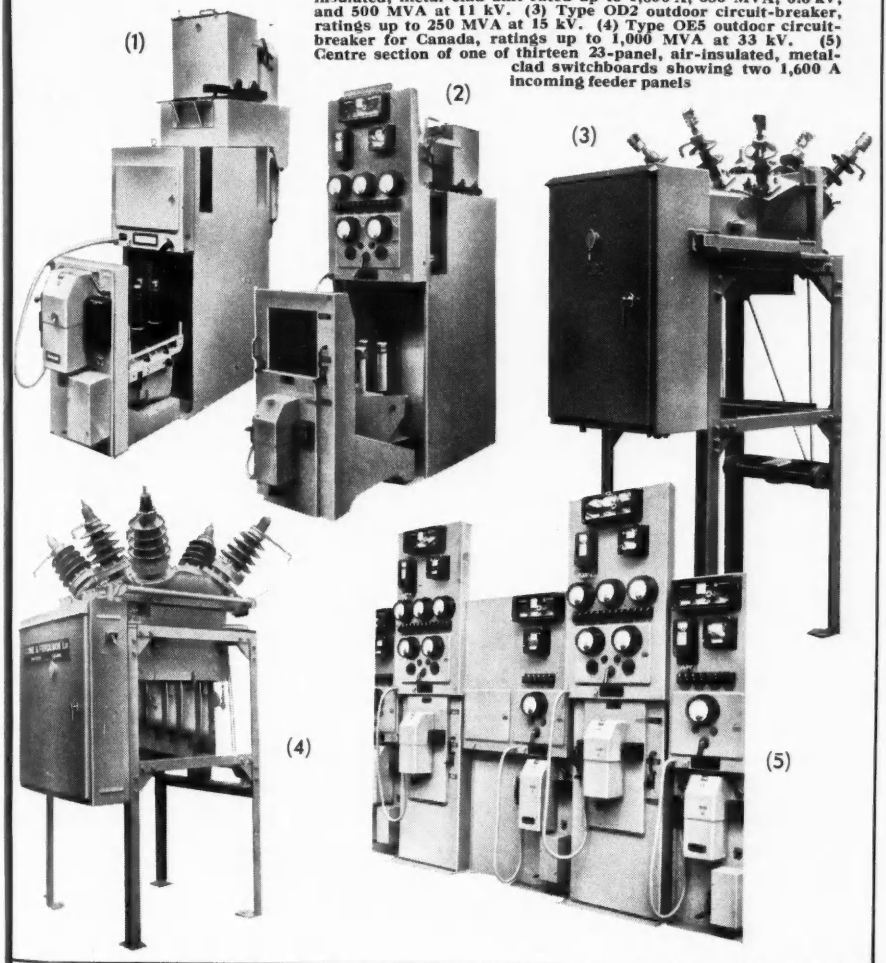
To establish a completely comprehensive range of equipment a series of outdoor circuit-breakers and ancillary equipment has been developed in parallel with the indoor metal-clad units and circuit-breakers. At the present time there are in production outdoor circuit-breakers ranging from a 150 MVA at 11 kV frame-mounted assembly to 1,000 MVA at 66 kV, with an emphasis on the 33 kV ratings which are covered for 250, 500, 750, 1,000 and 1,500 MVA breaking capacities. The emphasis of development on the 33 kV section has culminated in the production of the type OE3 circuit-breaker, of very economical design, which has been "proved" after a particularly

onerous series of short-circuit tests to have a superior performance at 500 and 750 MVA.

Regard is had for the export market, particularly the hard currency areas, by paying due attention to the requirements of the Canadian, American and V.D.E. specifications, in addition to our own British Standards.

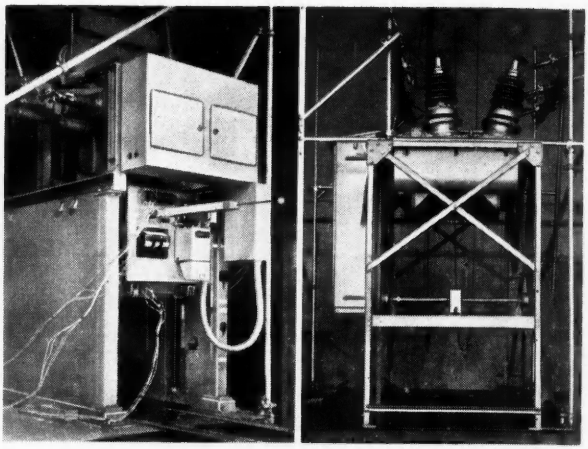
Acceptance of this company's products was underlined by the long-term contracts placed by the Manchester, Swansea and Johannesburg Corporations within the first few years of commencing switchgear production. Further endorsement came from the former Central Electricity Board which issued instructions in 1947 for two 500 MVA at 33 kV switching stations (one outdoor, the other duplicate busbar metal-clad) to be equipped with Cooke & Ferguson gear.

The normal works loading this year



(1) Type UTD duplicate busbar, air-insulated switch unit rated up to 1,200 A, 350 MVA, 11 kV. (2) Type UD5 single busbar, air-insulated, metal-clad unit rated up to 1,600 A, 350 MVA, 6.6 kV, and 500 MVA at 11 kV. (3) Type OD2 outdoor circuit-breaker, ratings up to 250 MVA at 15 kV. (4) Type OE5 outdoor circuit-breaker for Canada, ratings up to 1,000 MVA at 33 kV. (5) Centre section of one of thirteen 23-panel, air-insulated, metal-clad switchboards showing two 1,600 A incoming feeder panels

covers the routine production of complete 33 kV installations for seven of the home supply areas and a recently installed 33 kV switching station at Beauly for the North of Scotland Hydro-Electric Board, coupled with main station switchgear for a large Scottish oil refinery. Export trade contracts are in hand for South Africa, India, Australia, Portugal, South America and Canada, the last mentioned including a preponderance of 34.5 kV and 69 kV circuit-breakers. Climatic conditions in Canada have necessitated involved design modifications to cope with temperatures down to minus 40 deg C.



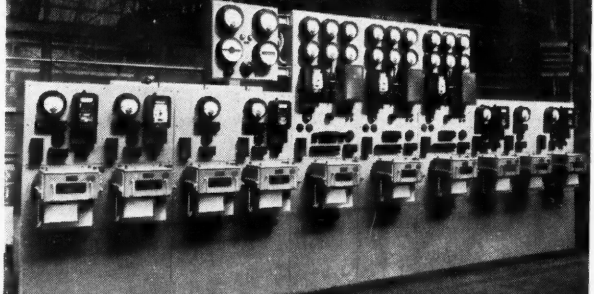
Type FTE5 duplicate busbar, phase-segregated, metal-clad unit in test cell, ratings up to 1,000 MVA at 33 kV, and (right) type OE3 outdoor circuit-breaker in test cell, ratings up to 750 MVA at 33 kV

The actuation of circuit-breakers presents a number of special problems in mechanical engineering, due to the facts that the mechanism is not normally in frequent operation and that static friction predominates. A circuit-breaker must, however, be entirely reliable in operation in an emergency. The designer's problem is also complicated by the allowance that has to be made for superimposed short-circuit forces.

Special attention is paid to these points in design, in particular by eliminating to the greatest possible extent the effects of electromagnetic forces, which is more readily achieved with the single-break type of design. Exhaustive type tests are applied to each design, including endurance tests far exceeding the normal 500 operations called for in the relevant British Standards. The speeds of operation are checked by means of an electromagnetic oscillograph. The force-diagram characteristic of each design is also determined to ensure adequate co-ordination with the operating mechanism.

Liberal use is made of jigs and fixtures during manufacture and assembly to ensure interchangeability and consistency of operation, while all breakers are subjected to routine no-load operations prior

Low-voltage industrial pattern switchboard for South Africa



Assembly bay for 33,000 V outdoor circuit-breakers

to dispatch in accordance with B.S.116. Hydraulic tests are applied to the tank and top-plate assemblies to ensure an adequate margin of safety against the maximum pressures that can arise during short-circuit operations. Other mechanical tests include routine adhesion tests on resin-bonded paper bushings.

In addition to the normal 50 c/s stresses which are continuously present when switchgear is in service, the insulation level must be adequate to withstand high-frequency transients due either to lightning disturbances or switching surges. Quality of materials plays an important part in maintaining the insulation level under normal operating conditions, particularly in damp and polluted atmospheres. In this respect Cooke & Ferguson are fortunately able to utilize porcelain insulators for ratings up to 350 MVA at 11 kV. For higher breaking capacities for which bakelite bushings are necessary, quality control is ensured by routine power factor testing, X-ray examination and high-voltage testing, finalized by the storage of bushings in a controlled atmosphere.

Type tests at 50 c/s ensure a basic margin of safety for all rated operating conditions, but additional attention has been paid from the outset to impulse voltage levels, for both indoor and outdoor applications. For example, it is possible to obtain an impulse withstand level of 95 kV without extensive modifications to the standard 11 kV indoor air-insulated metal-clad unit, where site conditions warrant the extra cost of the higher insulation level.

All outdoor circuit-breakers have been designed in accordance with the impulse levels called for in the American Standard specifications, and it is expected that these levels will be adequate to satisfy the requirements of B.S.116 when the new revision is published.

The thermal ratings have been assigned after careful tests under controlled conditions in the company's laboratory. The switchgear is normally designed to operate within the range of atmospheric conditions laid down in B.S.116. In special circumstances extremes of temperature must be complied with, ranging from tropical to sub-Arctic. As an example, a number of outdoor equipments have been subjected to severe tests in the cold chambers of the Ministry of Supply and Air Ministry at temperatures down to minus 40 deg C.

The most spectacular duty of a circuit-breaker is its performance under short-circuit conditions. The test procedure is laid down in B.S.116/1937 and the complete range of C. & F. breakers has been tested in accordance with this specification. The first tests, in the range of

breaking capacities up to 250 MVA at up to 11 kV, were made at the British short-circuit testing station at Hebburn and A.S.T.A. certificates have been obtained.

Under the terms of the company's association with C.P., Ltd., further tests of the larger circuit-breakers have been carried out in recent years at the Chelmsford testing station and the ratings of 350 MVA at 6.6 kV and 11 kV successfully proved.

For ratings beyond 350 MVA and at higher voltages than 11 kV it has been necessary to obtain test facilities abroad, so, in 1946, a series of tests were carried out at the A.S.E.A. testing station, Ludvika, Sweden. These tests ranged up to 1,500 MVA at 33 kV and 44 kV on outdoor breakers and up to 1,000 MVA at 33 kV and 750 MVA at 11 kV on indoor designs.

More recently the K.E.M.A. testing station at Arnhem, Holland, has been restored to service after the damage sustained during the war (*Electrical Review*, 9th June, 1950) and as it is the only independent testing station in Europe, the company has entered into a ten years' agreement with K.E.M.A. for facilities which will permit the full-scale testing of 33, 66 and 132 kV circuit-breakers.

Even at the higher voltages, however, Cooke & Ferguson have successfully based much of their development work on reduced-scale tests at the Crompton Parkinson testing station. This has been possible due to the basic characteristic of the single-break breaker which is not appreciably affected by applied voltage. The results obtained with the high-speed single-break type of construction have shown that arc length is consistently short over wide ranges of current and that this type of construction is suited to breakers rated from the lowest voltages up to 66 kV. Problems of short-circuit testing, however, become rather more involved above 66 kV, and at the highest voltage ratings evidence suggests that multi-break breakers are likely to be desirable.

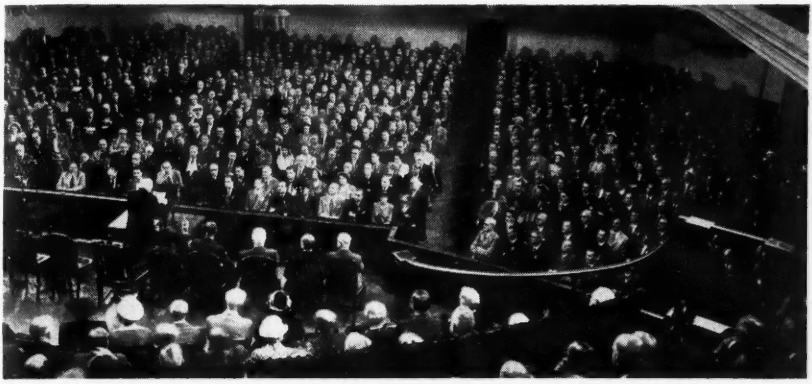
Brazilian Water Power Scheme

FORMED in 1948, the Companhia Hidro-Electrica do Sao Francisco, Brazil, is engaged upon the construction of a power station to harness the Paulo Afonso Falls, on the lower Sao Francisco River, for the purpose of supplying electricity to towns and rural districts in the neighbouring States within a radius of 220 miles. The Falls have a power potential sufficient for 400,000 kW, which can be raised to 900,000 kW when the flow of the river above them is regulated. The company's immediate programme provides for two groups of 60,000 kW each, generating at 60 c/s. Of the initial capital of 400 million cruzeiros (£7,600,000) 50 per cent in ordinary shares was subscribed by the Federal Government, 20.8 million cruzeiros in preferential shares were taken up by the public, and the remainder by State and municipal governments and federal autonomous institutions.

The company started from scratch in October, 1948. The wilderness around Paulo Afonso was cleared, roads and bridges, water, drainage and provisional electricity systems being built. Power was obtained at first from thermo-electric plant and later from a 2,500 kW hydro-electric station, inaugurated in October, 1949. By the end of last year a town of 6,000 inhabitants had grown up alongside the Falls. It includes school, hospital, church, sports ground, recreation centres and provision shops.

The final project for the power station was approved in July last. It provides for an eastern dam, 3,068 metres long, which begins on the left bank, crosses the principal arm of the river, deflects and continues south, crossing two other arms and ending near the canyon. The western dam begins at this point and extends for 1,147 m, making a 50-degree angle with the general direction of the eastern dam. From the point of intersection the waters are led by three shafts, 110 m long and 4.80 m in diameter, to the turbines in the underground machine gallery. The total discharge capacity is 22,000 cu m. The water returns to the river by a single tunnel, 10 m in diameter. Two pits connect the underground gallery to the surface. The total excavations, almost entirely in rock, will amount to 321,000 cu m. A gross head of 83.50 m will be utilized.

The control house above ground will be connected to the machine gallery by one of the shafts. Transforming plant (13.8/220 kV) will be accommodated in a substation on the right bank of the river, and two 220 kV lines 350 and 379 km long will transmit the supply to parts of Pernambuco, Alagoas, Sergipe, Paraiba and Bahia.



World Power Conference

Fourth Plenary Meeting in London

THE holding of the fourth World Power Conference in London (10th to 14th July) is one of the most important technical events of recent years. It is no less than fourteen years since the third W.P.C. was held (in Washington); going back further, the second and the first of these Conferences were held respectively in 1930 (Berlin) and 1924 (London).

Plenary meetings are normally held every six years; but the war of 1939-45 interrupted the sequence, so the fourth Conference was not able to arrange for its meetings to be held earlier than 1950. There are, however, Sectional Meetings, at which the more specialized aspects of power production are discussed; the first of these to be held since the war took place at The Hague, in September, 1947, when the subject of fuel economy was dealt with. In addition to its invaluable Statistical Year-book, the Central Office of the W.P.C., which is permanently established in London, has published "A Survey of the Present Organization of Standardization—National and International," and the British National Committee produced "Technical Data on Fuel," which has become a standard work. The papers and discussions of the various plenary and sectional meetings now number sixty-eight volumes.

The Conference was opened on Monday afternoon in the Central Hall, Westminster, by Sir Harold Hartley (chairman) who delivered a message of welcome from the Princess Elizabeth (patron), which was translated into French by M. Pierre Lion.

Mr. Kenneth G. Younger (Minister of State) welcomed delegates on behalf of the Government, and was followed by the Mayor of Westminster.

Then came speeches in response by M. P. Auger (UNESCO), M. E. Audibert (France), Mr. A. M. Jacobs (South Africa), Dr. E. Lombardi (Italy), Mr. E. G. Westerberg (vice-president, International Commission on Large Dams), M. A. Caquot (president, International Organization for Standardization), and Dr. F. Vogt (Norway).

The theme this year is "Energy Resources and the Production of Power" and the papers, numbering 156, submitted by the national committees of twenty-eight countries, have been grouped into various sections. What follows is an outline of the most important matters emerging from those papers which are of electrical interest.

Reports on Power Resources

The first technical session of the conference was arranged to allow the pre-

sentation of reports by authors from twenty-six countries, dealing generally with the power resources of their respective territories. Despite the fact that certain countries, notably certain of those behind the "Iron Curtain," have hardly participated in the Conference, while others, though taking part, have not offered papers dealing generally with their indigenous sources of energy, the remarkable array of papers presented at this session accounted for about 30 per cent of the land surface of the globe and nearly 40 per cent of its inhabitants.

The sudden effect of the war of 1939-45 on the fuel situation in every country is most marked in these papers; in practically every case we are shown how different countries attacked their problems in different ways, by developing substitute fuels, by drawing more heavily on timber resources than was normally justifiable, or by pressing on with electrical transmission and interconnection projects. These were in many cases frankly emergency measures, which could not have continued indefinitely. The holding of the Conference in 1950, instead of, say, two or three years ago, enables the various authors to present very interesting and valuable accounts of how their countries have begun to resume normal working after the war, and how in practically every case the increased electrical demands of industry have created new problems in the supply industries.

Gt. Britain.—Coal reserves in Gt. Britain are held to be sufficient to meet the needs of the next 100-200 years, assuming that the present rate of usage prevails. The possibility of further developments in water-power schemes is considered, but it seems clear that this source of energy does not seem likely ever to attain more than a fraction of the importance of coal in this country. The production of electricity in 1949 had reached eight times the figure for 1924, and the generating capacity during the same 25-year period had increased 3½ times. While not envisaging water power as a serious competitor of coal in the production of electricity, the British report, which is compiled by the Ministry of Fuel and Power, states that should it prove worth while to exploit wind and tidal power, the United Kingdom will be well situated. The particularly rapid development of the gas turbine in Great Britain is noted, with an eye on the usefulness of these prime movers for peak-load power generation in central stations, where their thermal efficiency is expected to reach 28 per cent or even more.

Ireland.—The Republic of Ireland is covered in a separate report, which shows that, of the limited amount of potential water power available, about one-third has already been harnessed. The most promising of the native energy resources is the substantial reserve of peat, which at recent harvesting rates is likely to last for perhaps 100 years; plans for the large-scale harvesting of peat by mechanical means are well developed, and are, in fact, described in detail in one of the other papers contributed to the Conference.

Scandinavia.—Coming now to Continental Europe, the countries represented in this series of reports may be grouped into Scandinavia; Central Europe; West Coastal

At the opening meeting in the Central Hall, Westminster, showing (left to right) M. P. Auger, UNESCO; Mr. Kenneth G. Younger, Minister of State; Sir Harold Hartley, chairman; M.A. Caquot, president of the International Organisation for Standardisation; Dr. F. Vogt, Norway

Europe; and Southern Europe. Scandinavia, comprising Norway, Sweden, Denmark and Finland, is (with the exception of Denmark) fortunate in regard to water power. Norwegian hydro-electric power shows a doubling of the developed capacity since 1924; some 16 per cent of the estimated total resources are now being drawn upon, and this is held to be ample for the needs of the future. The Swedish report admits to a scarcity of coal and liquid fuel reserves, but is able to point to an increase in water-power capacity to over 3½ times the corresponding amount in 1924, the present-day figure being about one-third of the estimated available resources. One of the difficulties to be faced in Sweden is that most of the water power suitable for harnessing is in the north, whilst most of the electricity demand, both industrial and domestic, is in the south, so that a great deal of long-distance transmission of power is inevitable.

Finland is perhaps the most versatile of the countries in this group; in addition to a well-developed hydro-electric system, which produces about 65 per cent of the total power generated, she has extensive forests and peat deposits, which attained a great significance during the war when it was practically impossible to import coal. The loss of some territory after the war created difficulties in the generation of electricity by water power; moreover, the demand for power also increased, so plans for new generating plant have been made, and it is expected that in four years' time Finland will be using 54 per cent of the available water power reserves.

In Denmark, the only indigenous fuel obtainable in quantity is peat, and this alone is insufficient for the country's needs. To use imported fuels with maximum economy, generation is concentrated in the big towns, combined with district heating. The interesting possibility of importing energy from, say, Norway, by extra-high voltage submarine cable is again discussed. This proposal formed the subject of a paper to the Third World Power Conference in 1936.

Central Europe.—In Switzerland it is reported that the consumption of electricity has trebled since 1925. Water power continues to be the main source of energy; but even to-day only about one-third of the available hydro-electric power sources are in actual use. One of the worries of the engineers in electricity undertakings depending on water power is the fluctuation in rainfall, but in that respect it is found that in Switzerland there is a good balance between the amounts of water available in summer and winter. A good deal of electricity is exported, as a surplus after providing for the country's needs. Thermal generating capacity is only 6 or 7 per cent of the hydro-electric generating capacity.

Austria has enough brown coal to meet about one-third of her demand for solid fuel. Only about one-eighth of her potential water power is harnessed, but even this small fraction leaves a margin for export; interchange of electric power with Germany is being developed. Here, too, some thermal power plant is considered essential to enable power stations to meet consumers' demands when water power falls off. Generating capacity in 1949 was five times the amount for 1924, in hydro-electric plants alone.

Hungary has been lucky in finding supplies of oil and natural gas within her boundaries. The production of oil is sufficient to meet home needs and to leave a margin for export. Some big hydro-electric

The Mayor of Westminster; Mr. A. M. Jacobs, South Africa; Mr. E. G. Westerberg, vice-president of the International Commission on Large Dams, and M. Pierre Lion interpreting Princess Elizabeth's message of welcome.

On the Conference platform at the Central Hall showing Dame Caroline Haslett, Sir Vincent and Lady de Ferranti, Sir Johnstone Wright, Mr. J. R. Beard and Mrs. Beard, and Mr. J. D. Peattie

developments are contemplated in connection with the Danube and the Tisza; but the main energy resources are the coal and brown coal deposits.

In Czechoslovakia, the rivers are small and their flow is variable, both of which features are discouraging for hydro-electric schemes. The country relies chiefly on coal, lignite and brown coal. One of the most interesting developments there is the parallel working between Czechoslovak and Polish power stations, which is to be extended with the erection of 220 kV lines linking water-power stations and large stations adjoining the coalfields.

Western Europe.—In France, it is estimated that the coal will last for 100 years at the present rate of use, which suffices for 70 per cent of the country's requirements. There are notable reserves of hydro-electric power, production of which will be nearly doubled in two years' time. Wind power and tidal power are being investigated.

Portugal's electricity production quadrupled between 1927 and 1948. Water power remains the chief source of energy, and is located mainly in the north, so that, like Sweden, an extensive system of transmission is required. As in many countries relying on hydro-electric power, fluctuations in rainfall necessitate the provision of a certain proportion of thermal generating plant, equivalent to about 30 per cent of the hydro-electric capacity.

In Belgium, dependence is placed chiefly on coal, and the same is true of the Netherlands, though in both countries a small proportion of the energy requirements comes from hydro-electric sources. In both countries, too, the destruction of plant during the war was very considerable. Some encouraging results have attended borings for natural gas in the eastern Netherlands.

Southern Europe.—Italy, Yugoslavia and Greece are the three countries represented here. Greece has considerable resources of potential energy, owing to its high mountains and swiftly running streams, but is not developed to a large extent. Italy has worked hard in harnessing hydro-electric power, and is now using 40 per cent of the amount theoretically available. The most interesting items, however, are the geothermic generating stations and the increasing use of natural gas; for the latter, a system of pipe-lines has been laid for its distribution. Natural gas is also one of the promising resources of Yugoslavia which, while rich in crude petroleum, oil shales, brown coal and lignite, has made comparatively little use of her hydro-electric power resources.

Asia.—The only reports dealing with energy resources in Asia come from India and Pakistan. The latter was unfortunate as regards coal reserves when her boundaries were being fixed, but there are some reserves in Sind and Baluchistan. India has fairly good coal reserves and a large water-power potential. The installed hydro-electric capacity is three times what it was in 1925.

Africa.—The African reports deal with energy production in Algeria, Egypt and the Union of South Africa. Algerian resources are in coal and in hydro-electric power; by 1952 it is expected that the latter will make use of one-third of the available quantity. There are activities in drilling for oil, but no close estimates of the yield can be made. Solar energy is a subject which is being studied, owing to its attractive possibilities in that country. In Egypt, the use of the Aswan dam for generating electricity is being planned, despite the civil engineering difficulties. Eventually, however, it is hoped to develop electric power production on the Upper Nile, and so replace the Aswan dam as a source of

energy for the steel and fertilizer industries of Lower Egypt.

Egypt, however, provides the most novel idea of all for the production of hydro-electric power—letting water from the Mediterranean flow into the Quattara Depression, and thus providing for 300 MW capacity. There is no outlet to the depression, but the incoming water would be removed by natural evaporation.

South Africa relies on its abundant coal as its main source of power. There are certain natural difficulties attending the production of electricity which cannot be easily solved. It is very difficult to spare enough water for cooling purposes in thermal power stations; in addition, the rainfall is unreliable, so that hydro-electric power is not attractive as a future development, and there are insufficient sites for the convenient storage of water. Nevertheless, electricity output in 1946-47 rose to 5½ times the figure for 1924-25.

Australasia.—One of the most remarkable things emerging from the Australian National Committee's report is that although Tasmania represents less than 1 per cent of the total land area of the Commonwealth, it contains almost 80 per cent of the total available water resources. This is due to Tasmania's exceptional rainfall compared with that of the Australian continent. The most important hydro-electric power developments on the Australian mainland are the Snowy River and the Kiewa projects. New Guinea and Papua have water-power resources far exceeding their requirements. As regards solid fuels, Australia has enough reserves of coal, brown coal and lignite to last for a very long time. Deposits of coal and lignite have also been found in Papua and New Guinea, but have not been worked commercially.

North and South America.—Canada is one of the world's most fortunate countries in her reserves of hydro-electric power; the capacity has trebled since 1924, yet even to-day, only one-fifth of the total resources are harnessed. Coal is plentiful, though rather awkwardly located in relation to industrial and domestic consumers. There are considerable reserves of oil and natural gas, and it is estimated that within ten years Canada's whole oil requirements will be met from home-produced stocks.

In the United States there is still so much coal that no particular anxiety is felt about the future. Coal remains the country's most important fuel and is likely so to continue; the estimate cited in the report was made on 1st January, 1944, when the reserves were given as $2{,}814 \times 10^9$ metric tons. Since the first World Power Conference in 1924, the annual production of oil in the United States has trebled; but even this steep rise is eclipsed by the increase in the use of natural gas, which has quadrupled. No less than 10 per cent of the country's consumption of energy is derived from the latter source. Water-power resources have been re-estimated, and in the last twenty years the amount available is shown to be twice as great as that given at the beginning of the period. About one-sixth of the potential water-power reserves of the United States is by now being used for the production of electricity.

The South American continent is represented by a report from Chile, in which there are some reserves of coal, oil and timber, though the most important energy resources are the short, swift rivers from the Andes to the coast. It is possible to achieve a very high degree of utilization of the available flow by interconnection between run-of-river plants and reservoir plants, taking advantage of the natural features of the country; and this has been fully allowed for in the development programme for the future.

Reception of Delegates

On Monday evening there was a Government reception at the Science Museum, South Kensington, when Mr. P. Noel-Baker, Minister of Fuel and Power, received some of the guests.

On Tuesday morning there was a ladies' reception by Lord Citrine at the Winsley Street premises of the B.E.A., and on Tuesday evening there was a reception in the Guildhall by the Lord Mayor and Lady Mayoress, Sir Frederick and Miss Rowland.

There was a B.E.A.M.A. dinner at the Connaught Rooms on Wednesday and the official Conference banquet is at Grosvenor House this evening (Friday), and the Conference concludes to-morrow (Saturday) morning.

Arcing Characteristics of Fuses

AMONG recent E.R.A. publications, Report Ref. G/T228 "Arcing Characteristics of Fuses with Small Overcurrents," by H. W. Baxter, B.Sc.(Eng.), A.M.I.E.E. and M. T. Cree, is the seventh report in a series dealing with fundamental fuse research, its predecessor being Ref. G/T204. It discusses the question of fuse performance on small over-currents which is a zone of the range in which operation is inherently difficult. The conclusions are supported by reference to test results and calculations. This publication is obtainable from the Electrical Research Association at Thorncroft Manor, Dorking Road, Leatherhead, Surrey, price 7s 6d, postage 3d.

VIEWS on the NEWS

By REFLECTOR

IN the House of Lords debate on the nationalized industries last week, Lord Pakenham admitted that a good deal more could be done to make the existence of the consumers' consultative machinery a reality for the average person. I wonder how many people know how to get in contact with their coal, electricity and gas consumer organizations? So far as the electricity bodies are concerned, it is my experience that the councils themselves are in the main performing their duties assiduously, but are rather remote. The local committees, which are the obvious means of contact with the people, hold their meetings in private, and very little is known of them. Generally speaking, it is doubtful whether the present councils have yet proved such an effective medium for voicing complaints as the local authorities were before nationalization. There is, in fact, a good deal to be said for retaining them to provide local representation, as is done in the North of Scotland.

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It is difficult to say which domestic appliance is the most in demand these days, but if I had to give a guess I would say that it was probably the washing machine, with the television set and the refrigerator close runners-up. Popularity of appliances differs widely from district to district, however, and I am quite prepared to believe that in the London and Midland areas television holds the field. One of the most striking developments arising out of the greater use of washing machines has been growing interest in ironing machines, it being a logical outcome that, with more laundry being done at home, the housewife should find the ironing part of the business irksome and should look around for further electrical assistance to ease her task. This being so, it is rather surprising that there should at present be only two self-contained ironers available. As was the case with the mixers, I foresee the production of a spate of new machines before long.

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Borrowdale, in the valley of the Derwent, is undoubtedly a place of great scenic attractions, the preservation of which—as of the many other beauty spots in this country—is a matter of concern to us all. To the inhabitants, however, it is equally important that modern services available elsewhere should be provided. Consequently, after thirteen years' agitation for an electricity supply, their relations with the Friends of the Lake District, have become a trifle strained, and Councillor F. G. Wilson recently suggested to the North Western Consultative Council that the Friends should be ignored in the negotiations. "Every time we want something, water, sewage disposal, or electricity, these old friends turn up to object," he said. The Consultative Council is now endeavouring to act as peacemaker. The problem is a difficult one, but in other places it has been found possible to find a solution if approached in a spirit of compromise.

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Inch lamp-posts, referred to in a local report, are not a new form of road-level lighting, though they may be of a special type. At the Inch (an Edinburgh locality) the City Council has a "show" estate, and the Housing Committee feels that the pillars should be in keeping with the surroundings. The lighting manager has suggested that if concrete pillars are provided they could be coloured as required. The proposal has been rather coolly received by the Works Committee, which is reluctant that any place should get preferential treatment involving extra expense. However, the lighting manager has been asked to "liaise" (whatever that means) with the housing executive officer, and report to the Committee.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Jackson Electric Stove Co., Ltd., announces the resignation of **Mr. T. J. Lattimer** who entered the electric heating industry in 1920 as chief designer to the Electric Heating Co. Mr. Lattimer joined the Jackson Electric Stove Co. in 1930 and was technical engineer to the company.

Mr. A. S. Kohler, manager, Concrete Column Department, Stanton Ironworks Co., Ltd., has been appointed manager of Erecon, Ltd., of Ware, Herts. Mr. Kohler served his apprenticeship as an engineer with the former British Mannesman Tube Co., and later spent some years installing new plant for Baldwin's, Ltd. He returned to the British Mannesman Tube Co. as draughtsman and estimator, and subsequently became associated with Stewarts & Lloyds and the Stanton Ironworks Co., Ltd.

Mr. A. S. Kohler

Earl de la Warr, P.C., J.P., has been appointed a director of the Brush Electrical Engineering Co., Ltd.

Mr. A. C. Gooder, M.I.Mech.E., has been elected president of the Engineering Surveyors' Association for 1950-51, and **Mr. F. S. Bowen** vice-president.

Mr. J. Dodson, B.Sc.(Eng.), A.M.I.E.E., has resigned his appointment as chief electrical engineer with Thomas Broadbent & Sons, Ltd., Huddersfield, and is taking up the position of assistant works engineer at the Chapel-en-le-Frith works of Ferodo, Ltd., on 1st August, where he will be responsible for development work in connection with engineering and plant services. Mr. Dodson has been with Thomas Broadbent & Sons for the past five years, and was previously for ten years with I.C.I., Ltd., Dyestuffs Division at their Huddersfield works, where he received his training in general engineering.

Mr. P. C. Barrand, A.M.I.Mech.E., Associate I.E.E., has rejoined his old company, the Brush Electrical Engineering Co., Ltd., as outside manager of the erection department covering turbine and electrical products.

Mr. D. G. Wilson, a graduate apprentice of the Brush Electrical Engineering Co., Ltd., Loughborough, is the first winner of the company's fellowship award of £400 per annum tenable for two years. In the near future he will proceed to the University of Nottingham to conduct research associated with gas-turbine development under the direction of Dr. J. A. Pope, the professor of mechanical engineering.

Mr. T. Emmerson, B.Sc., Ph.D., A.Inst.P., has been appointed director of research for the G.K.N. group of companies from 27th June. Dr. Emmerson joined Joseph Sankey & Sons, Ltd., in October, 1945, after spending the war years in research for the Admiralty, and has been acting director of the G.K.N. Laboratories since October, 1949, when Mr. N. F. Astbury resigned to take up a Research appointment in Australia.

Queen Juliana of the Netherlands has conferred on **Mr. J. H. Brebner,** O.B.E., chief public relations and publicity officer, British Transport Commission, the decoration of Commander in the Order of Orange Nassau in recognition of the services which he rendered to the Netherlands cause during the war.

Mr. C. E. D. Greenhalgh, M.I.E.E., formerly electrical engineer and manager of the Ilkley U.D.C. electricity undertaking, has been approached by the Ilkley Council to act as part-time technical adviser in connection with street lighting, housing installations, and all other electrical matters.

Mr. E. E. Grover, who has been areas manager (mining) for A. Reyrolle & Co., Ltd., for twenty-one years, retired on 30th June. Before taking up this appointment he was the representative for mining equipment for the company in northern England, and in all has served with Reyrolle's for thirty years. He is succeeded by **Mr. H. Taylor** who is the company's specialist engineer on mining products.

The 1949 Lamme Medal of the American Institute of Electrical Engineers has been awarded to **Mr. C. M. Laffoon,** manager of the A.C. Generator Engineering Department of Westinghouse Electric Corp., for "outstanding contributions to the design of elec-

trical machines, particularly large turbine generators and high-frequency generators." The medal was presented to Mr Laffoon at the summer meeting of the Institute held in June last.

Mr. W. F. Little, engineer at Electrical Testing Laboratories, Inc., has, according to the *Electrical World,* been awarded the gold medal of the American Illuminating Engineering Society for 1950. It will be presented to him at the National Technical Conference to be held at Pasadena next month.

Mr. W. N. Goodman has resigned from the board of the Sturtevant Engineering Co., Ltd., on account of ill-health.

The Telcon Social and Athletic Club of the **Telegraph Construction & Maintenance Co., Ltd.,** held its annual sports meeting at the Telcon Sports Ground, Kidbrooke, on 1st July. Nearly 100 competitors took part in a comprehensive programme of events. The Engineers' Department won the inter-departmental challenge cup, and the prizes and trophies were presented by Lord Colgrain, the chairman of the company. Among those present were the Mayor and Mayoress of Greenwich, Messrs. J. N. Dean (managing director), J. Innes, B. H. Musgrave, W. F. Randall (directors), Dr. E. W. Smith (director of Submarine Cables, Ltd.), Col. R. W. C. Reeves (director of Johnson & Phillips, Ltd.), and Mr. F. Leighton (works manager) president of the Club.

During the Harrogate Convention play for the G. P. Dennis golf trophy and in a four-ball bogey competition took place at the course of the Pannal Golf Club in aid of the **Electrical Industries Benevolent Association.** The winner of the trophy was Mr. J. Gogan of the S.W. Scotland Electricity Board, Mr. R. E. Silvey (Santon, Ltd.), being second. Sir Henry Self (deputy chairman of the B.E.A.) and Sir Thomas Spencer (Standard Telephones & Cables, Ltd.), tied for third place. In the four ball better ball against bogey competition Sir Henry Self and Mr. J. N. Waite (controller, B.E.A. London Division) tied for the first prize, and Mr. J. Gogan and Mr. J. Meek (S.W. Scotland Electricity Board) tied for second place. The winners were entitled to half sweep but gave their share to the E.I.B.A. funds, the total contribution to the funds from both competitions being £30.

The final of the third annual interworks ambulance competition of **Associated Electrical Industries, Ltd.,** took place at the Willesden works of the British Thomson-Houston Co., Ltd., on 9th July. The competition was inaugurated by A.E.I. directors to foster and promote interest in volunteer ambulance work and is open to all companies in the group. This year's finalists, B.T.H. teams from Rugby, Chesterfield and Willesden, each went through the same tests. The Willesden team won the cup for the second year in succession, the presentation being made by Mr. H. E. Cox, manager of the Willesden Works.

OBITUARY

Mr. F. C. Polden.—The death occurred on 3rd July, at the age of seventy, of Mr. Francis Charles Polden, C.C., M.I.E.E., M.I.Mech.E., the well-known electrical contractor and managing director of Francis Polden & Co., Ltd., of Cannon Street, London, E.C.4. Mr. Polden was responsible for many important electrical installations in London and in various parts of the country, some of his earlier installations including those at the Stock Exchange, Aldwych House, Kingsway Hall, Dr. Barnardo's Home, Hertford, and numerous country mansions. His company took a prominent part in the floodlighting schemes for many famous City buildings during the Faraday Centenary Celebrations of 1931, the Silver Jubilee of King George V and Queen Mary, and the Coronation decorations in 1936. Mr. Polden was active in City of London affairs, being elected to the Common Council representing the Vintry Ward Club in 1927, and he was chairman of a number of City Committees, including the Coronation Decorations and Illuminations Committee. Early in 1936 he was appointed by the Court of Common Council of the City of London as its representative on the London and Home Counties Joint Electricity Authority, and on the nationalization of the electricity supply industry he became a member of the London Electricity Consultative Council. He was also a member of the Electrical Contractors' Association and of the London Chamber of Commerce. The accompanying portrait was taken some years before the war.

The late Mr. F. C. Polden

WILLS

Mr. J. W. Warren, M.I.E.E., founder of Warren, Beattie & Co., Middlesborough, who died on 21st April last, left £2,323 gross (£2,248 net).

Mr. D. Bonney, chief of external relations divisions and late deputy publicity manager, English Electric and Marconi group of companies, who died on 23rd March last, left £10,803 gross (£9,131 net).

The I.E.E. at Cambridge

A Memorable Summer Meeting

AN appropriate and greatly appreciated introduction to the three-day summer meeting of the Institution of Electrical Engineers was the Tuesday evening historical lecture, illustrated with lantern slides, in which Mr. G. F. Hickson (secretary of the University Board of Extra-Mural Studies and a former Mayor of Cambridge) sketched the probable origin of the town and foundation of the first colleges out of which grew the University that became the cradle of the natural sciences.

Afterwards members and their ladies adjourned from the lecture theatre in the Arts School for an informal reunion and light refreshment in the small examination hall of the same building.

On the Wednesday morning there was a visit to the works of Pye, Ltd., where a demonstration of television in colour preceded a tour of the factory. This concern has been established over fifty years and last year was its twenty-first as a public company. The original instrument section of the business is still being carried on by W. G. Pye, Ltd. (X-ray and optical analysis of crystal structure) now linked with Unicorn Instruments, Ltd., while vacuum-physics devices and glass-to-metal seals are made by Cathodeon, Ltd. Another recent acquisition is Magnetic Devices, Ltd. (relays) which is associated with the Guardian Electric Corporation of Chicago.

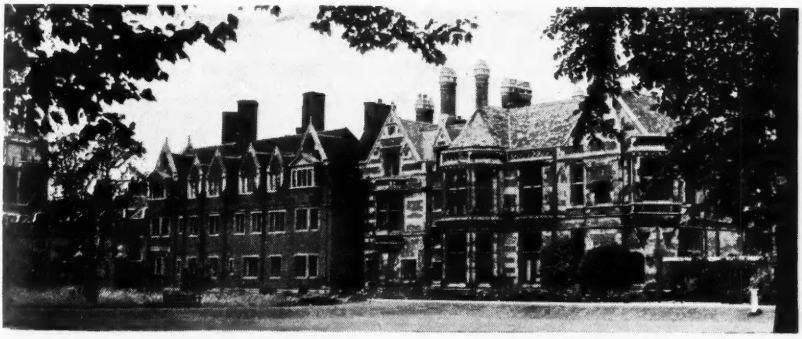
Also within the group are Pamphonic Reproducers, Ltd. (public address equipment), Pye Telecommunications, Ltd. (including radar), L. G. Hawkins & Co., Ltd. (electrical appliances) and Woodcraft Productions, Ltd.

Pye radio sets were marketed twenty-five years ago and last year in conjunction with Murphy Radio the first licence was secured for a sound-vision relay service which is now being experimentally operated in Gloucester by Links Sound & Vision Services, Ltd., a joint subsidiary.

Pye (Ireland), Ltd., manufactures in Ireland and the Corran Works, Ltd., at Larne in Northern Ireland makes radio sets for export. Pye (Canada), Ltd., is a fully owned subsidiary and Pye (Australasia), Ltd., is a controlled company.

Luncheon as the guests of the Eastern Electricity Board with Mr. C. T. Melling (chairman) presiding was followed by a garden party at Pembroke College which has been in existence for 600 years. Mr. S. C. Roberts (Master of Pembroke and Vice-Chancellor of the University) and

Part view of Pembroke College where tea was served on the master's lawn



One section of the Pye works laboratory visited during the I.E.E. summer meeting

Mrs. Roberts received the guests on the lawn where tea was served.

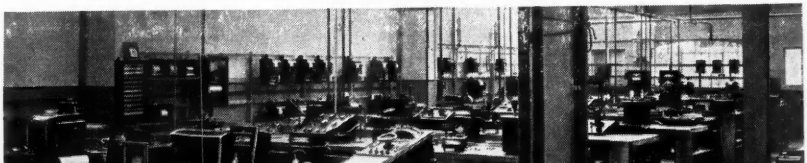
In the evening there was a reception (with dancing and refreshments) in the Guildhall by the Mayor and Mayoress, Ald. Capt. A. C. Taylor and Mrs. Taylor. It was a privileged occasion for I.E.E. members. Never before has Cambridge Corporation accorded a civic reception to any of the many societies and institutions which periodically confer in the university town.

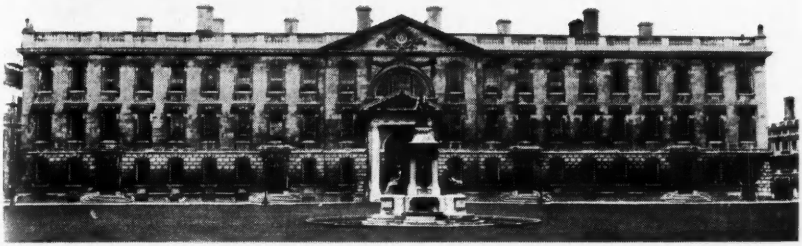
The Thursday morning was devoted to conducted tours of the colleges. After luncheon coaches carried the visitors to the Little Barford power station where tea was provided by the Eastern Division of the B.E.A.

The host of the evening was Mr. C. O. Stanley (chairman, Pye, Ltd) at a dinner-dance with cabaret which lively function, notwithstanding a short interruption of electricity supply, continued merrily throughout a three-hour thunderstorm of some severity.

On the Friday most of the ladies went on a coach excursion to Ely Cathedral. Another party spent a profitable morning in the spaciously modern University Engineering Laboratories which, as mentioned last week, are being enlarged considerably. A third party inspected the 30 MeV synchrotron of the Department of Radiotherapeutics adjacent to and working in collaboration with Addenbrooke's Hospital, followed by a tour of the Cavendish Laboratory wherein exists an extensive collection of apparatus used in the great classical era in which physics was established as an experimental science apart from natural philosophy and chemistry. It was the creation of the Cavendish chair which for the first time gave physics a home of its own, begun in 1871 and officially provided by the University, where students could experi-

Portion of the instrument test room at the Cambridge Co's works in Cambridge





King's College where the president entertained members and guests at dinner in Hall

ment and the staff could pursue research.

Previously professors had by tradition lectured in university rooms, but research —their private concern—had to be conducted as best they could without the aid of skilled teams of mechanics in laboratory workshops, or professional instrument makers. Indeed, the then newly appointed Prelector in Physiology experienced great difficulty in equipping his laboratory. Most of the apparatus needed had to be imported from abroad, but a pupil and colleague (A. G. Dew-Smith, member of Trinity College) assisted with the provision of a workshop and an instrument maker.

This wealthy amateur had worked in the Laboratory of Mechanisms (later to become the University Engineering Laboratory) until 1878 when he moved to his own premises and early in 1881 took into equal partnership (Sir) Horace Darwin, the youngest son of the famous biologist. After taking his degree in Trinity College, Darwin had worked for a few years in engineering firms before returning to Cambridge to take over the management of the works, which then had seven employees. He had marked ability in designing mechanical instruments; often delivered and himself set up the apparatus he had made. In the same year W. T. Pye, a skilled mechanic, was engaged as foreman and rose to be works manager. He left the company in 1898 to go into partnership with his son, W. G. Pye, in the business of that name to which reference has already been made.

Such was the beginning of what is now the Cambridge Instrument Co., Ltd., which was visited on the Friday afternoon. Sir J. A. N. Barlow (chairman) was the host at tea in the works at Cambridge which are now mostly concerned with the construction of industrial apparatus, physical instruments and special-purpose equipment. Electrical apparatus, except that employed in instruments of the above types, is largely manufactured at the Muswell Hill works in London, which were purchased from R. W. Paul in 1919. This year an additional factory at Finchley was acquired, raising the number of people employed in England to over 1,000. In 1922 an associated company was formed in America.

The last function of the meeting was memorable. The Provost and Fellows of King's College accorded the visitors the privilege of dining in the Hall. The occasion gave Prof. E. B. Moullin (president of the I.E.E.) the special satisfaction of greeting members of the Institution assembled in his old college and of acknowledging the cordial hospitality shown them during the meeting.

Sir Will Spens (Master of Corpus Christi College) responded with some observations on what he considered to be the need for more direct technical education by means of general courses like those of the M.I.T. in America rather than by "casual contagion" in British university tradition. His desire was not for destruction, but for greater variety and some experiment.

Mr. C. O. Stanley (chairman, Pye, Ltd.) also responded with an expression of his belief that the "town and gown" problem was rapidly becoming a thing of the past, for industry (appropriately conducted) need not be out of place in a university town and could be mutually beneficial.

NEW BOOKS

Progressive Mathematics. B. P. Clyne. Pp. 270+xii; figs. 121; index. Chapman & Hall, Ltd., 37, Essex St., London, W.C.2. Price 15s.

This is utility mathematics, in the best sense of the word, and as the author states in the preface, it is intended for "students reading mathematics. . . . to aid them with other studies than pure mathematics." The reader need not, therefore, look for mathematical elegance; nevertheless, the student is encouraged to examine closely the mathematical techniques he is acquiring, and frequent warnings occur, for example, against assuming without proof the converse of a proposition already established. In fact, as each new topic is introduced, it is quite exhaustively described in the most basic terms. After this it is developed concisely, omitting many of the traditional derivations, but with numerous examples in the text.

The book is intended for Higher National Certificate candidates for physics and engineering, to whose needs it appears to be admirably suited. The early chapters cover the differentiation of algebraical and trigonometrical functions after which the exponential is introduced, followed by maxima and minima. A chapter on infinite series precedes others on integration, the conic sections, j notation and hyperbolic functions, while in conclusion Fourier series and harmonic analysis, partial differentiation, and differentiation are discussed. Seven appendices include mensuration of the triangle, polar co-ordinates, and determinants.—P. L. D.

The Practical Electrical Reference Book. Pp. 384; figs. and index. Odhams Press, Ltd., Long Acre, London, W.C.2. Price 9s 6d.

The publishers say that this is the most concise electrical reference book yet published, and there is certainly some justification for a claim of this kind, for the work is extraordinarily comprehensive. Within a limited number of pages it has been skilfully planned and edited so as to preserve a good balance of treatment. After an excellent summary of the principles of electrical technology, the subjects of wiring, electrical machines, transformers and rectifiers, transmission, batteries, control gear, measurements and testing are dealt with. Subsequent sections cover nearly all branches of the utilization of electricity, including radio engineering and electronics, automobile and aircraft equipment, electricity in ships and electric traction, air conditioning and refrigeration, electric cranes and lifts, and electricity in mines. The book ends with a summary of Factory Regulations, a list of British Standards, and a brief digest of the I.E.E. Wiring Regulations.

The illustrations are clear and numerous, and there is a very full index. If the publishers are able to extend the scope of the book in a subsequent edition, it might be well to consider allocating sections to the subjects of power factor correction, tariffs and electric welding, matters which in the present edition are mentioned merely incidentally. The ordinary rank-and-file electrical engineer will find it a valuable and inexpensive work of reference that will keep him in touch with matters outside his own particular field. The book should also interest architects and power users generally.

Consumers' Association

THE annual meeting of the National Municipal Electricity Consumers' Association was held at the Central Hall, Manchester, on 4th July. The main business of the meeting was a long and detailed discussion on the urgent necessity for the decentralization of the industry and the delegation of certain of the executive powers at present exercised by the Area Boards to District Committees.

There was a general request by consumers in all parts of the country that facilities should be restored for the payment of both electricity and gas accounts at the town hall along with the local rates. The view was generally expressed that the Consultative Councils were serving little or no useful purpose due to the fact that Clause 7 of the 1947 Act gave them no executive powers. This applied to an even greater extent to District Committees. It was finally decided to bring these recommendations to the notice of the Minister of Fuel and Power.

Large Power Systems

Concluding C.I.G.R.E. Proceedings

WITH the resumption of technical discussions after the general meeting of the C.I.G.R.E. on the morning of Wednesday, 5th July, the subjects were divided into two groups which functioned simultaneously. In one, the advantages of non-laminated steel poles and pole shoes for alternators, with particular reference to their effect on the damping of oscillations and on stability, were brought out by a number of delegates. Mr. E. M. Johnson (Metropolitan-Vickers) showed that synchronous condensers of this construction could be started smoothly and synchronized with reduced voltage and gave satisfactory response to automatic voltage regulation.

Cable Developments

Dr. L. G. Brazier (B.I.C.C.) was chairman of the cables group, for which Mr. R. A. MacMahon (secretary, British National Committee, C.I.G.R.E.) acted as interpreter. M. Laborde and M. Tellier (Electricité de France) saw in some of the newer designs of high-voltage cable better prospects of reducing their capital costs (now from five to six times those of overhead lines) than were offered by oil-filled cables and gave particulars of the B.I.C.C. and Enfield cables among five being tested outside Paris. The authors stressed the importance of instantaneous overload capacity and impulse strength of the dielectric. Mr. E. M. Hollingsworth (Johnson & Phillips) described the aluminium-sheathed cables developed in Great Britain; he showed how the insulated cores were threaded into pre-extruded lengths of aluminium tubes, which were then swaged to form a sheath closely fitting over the insulation. Developments in styrene joints and terminations up to 66 kV as barriers against compound migration were described by Messrs. E. C. Lee and K. Konstantinowsky (Standard Telephones and Cables), who showed that elimination of the need for heating on site had greatly increased their potentialities.

Circuit-breakers were discussed all the following day by one group and overhead lines in the morning and vibration in the afternoon by the second group. Restriking voltage was a prominent feature of the first discussion, in which Messrs. L. Gosland and J. S. Vosper summarized E.R.A. work on 60 kV networks and Mr. J. S. Cliff gave particulars of the means adopted at A.S.T.A. stations to relate restriking-voltage severity to system conditions.

Investigations of Messrs. C. H. Flurscheim, K. J. Saulez and R. W. Sillars (Metropolitan-Vickers) indicated generally that linear resistance shunts could easily and simply be incorporated in high-voltage oil breakers but not in air-blast breakers; they defined the restricted conditions in which non-linear resistances were preferable.

Overhead-Line Practice

Among the papers on overhead lines, one by Messrs. S. Butterworth and E. E. Hutchings (E.R.A.) was commended as giving "with the customary British practical touch all the formulæ and data required for the electrical and thermal calculation of power transmission lines." A report by Messrs. S. R. Siviour (Yorkshire Electricity Board) and K. L. May (Southern Electricity Board) on the design of high-voltage distribution lines, with particular reference to unearthed-pole construction and vibration-trouble reduction, was also regarded as a very valuable contribution. Especial attention was drawn to a report by Mr. E. Richard (Electricité de France), who analysed and summarized overhead-line regulations of ten countries. The same author on Friday contributed a well-received assembly of data with comments on the design of transmission-line towers, mentioning with approval the proposals of Mr. H. W. Grimmitt for modifying the British regulations.

The transformer group of papers, on Friday, 7th July, was in charge of three British engineers—Messrs. H. M. Lacey (E.R.A.) as chairman, Mr. E. T. Norris

(Ferranti) as special reporter, and Mr. R. A. MacMahon as interpreter. Of the seventeen papers discussed, ten were entirely and two partly concerned with surge or impulse problems. The detection of damage during surge testing by comparison of surge-current wave shapes was held to be most promising and consideration was given by several authors to circuit constants and measuring techniques. An alternative to surge-current measurement was proposed in which high-impedance shunts (instead of low-impedance shunts) were used to record the natural frequencies of the windings.

Various methods of increasing inter-coil capacitance were described, including one by Messrs. A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn (English Electric), which involved the interleaving of conductors. Mr. Norris himself contributed a report on the operation of power transformers in which he emphasized the need for close co-operation between user and maker and dealt with the correct maintenance of winding insulating oil, the interpretation of Buchholz-relay indications and safe loading in relation to hottest-spot temperatures.

An important contribution to the knowledge of capacitor oils and testing techniques was made by Dr. J. L. Miller and Messrs. T. W. Hunt and J. H. Cozens (B.I.C.C.) on the last morning (8th July). The oil for this purpose was shown by various authors to differ from transformer oil essentially in that its condition was indicated by gas formation after electric "cracking" rather than by slow progressive oxidation.

A simultaneous meeting was held on insulators, over which Mr. G. H. Gillam (Taylor, Tunnicliffe) presided, when routine testing was discussed in the light of possible revisions of international specifications. Attention was also given to operation under favourable atmospheric conditions, the discussion being initiated by M. Schuepp (France) in a report submitted on behalf of the International Study Committee on Insulators.

The conference closed on Saturday afternoon, when the C.I.G.R.E. president, Mr. R. A. Schmidt, thanked those who had done so much towards its success. Included in these was the French National Committee whose generous hospitality, in varying forms, Mr. P. V. Hunter, chairman of the British National Committee, had acknowledged at a social function earlier in the week on behalf of the thirty-nine other nations. Mr. Schmidt also gratified the delegates by promising that, in order to avoid the likelihood of having to work in a superheat wave, as on the present occasion, future conferences would be held a month earlier in the year.

Power Station Water Supply

A PROPOSAL by the British Electricity Authority to pump water from an artificial water course between Beddington Sewage Farm and the River Wandle for the new Croydon power station was the subject of an action in the King's Bench Division recently. After a seven-day hearing judgment was reserved.

New Merton Board Mills, Bristol, and John S. Deed & Sons, Ltd., London, claimed an injunction to restrain Croydon Corporation and the British Electricity Authority from diverting or interfering with their use of sewage effluent entering the River Wandle. Plaintiffs contended that they had acquired the right to uninterrupted use and enjoyment of the water by prescription, and that the proposal contravened the River Wandle Protection Act.

Mr. D. Timmins, director of New Merton Board Mills, said that the level of water in the river was already so low that it was "touch and go" whether they would be able to carry on. On the other hand, Mr. F. N. Rendell-Baker, consulting engineer for the power station, claimed that there was no practical alternative source of supply for a power station erected on that site. The system had been designed to use sewage effluent, and if the supply was not available its effect would be to shut down the station.

There was some discussion on the amount of water that would be extracted. Plaintiffs asserted that the Authority proposed to take 4 to 6 million gallons a day for the cooling towers, while defence witnesses gave the extraction as $3\frac{3}{4}$ million gallons, of which $1\frac{1}{4}$ million would be returned. Mr. J. F. Shipley, consulting engineer, said that the new power station, working at 60 per cent load factor, would require 3.6 million gallons daily, and if increased to 100 per cent would need 6 million gallons.

Mr. Gerald Thesiger, K.C., for the Corporation, contended that the Act was for the preservation of the underground sources of the River Wandle.

Commerce and Industry

Purchase Tax on Fans
Continental Pithead Plant

FOLLOWING representations from the British Electrical and Allied Manufacturers' Association the Commissioners of Customs and Excise have decided that, until further notice, ceiling, table and bracket fans of the following kinds may be regarded as not falling within Group 12 of the purchase tax schedule: (a) Table and bracket fans having a rated consumption exceeding 80 W, or a blade sweep exceeding 16 in.; (b) three- or four-bladed fans designed for suspension from the ceiling and having a blade sweep of 36 in or more.

Pithead Power Plant

During the summer of 1949 representatives of the National Coal Board visited a series of German and Dutch collieries to obtain information on pithead generating plant, especially with regard to the extent to which low-grade fuels were actually burnt, methods used to effect this, and the reasons for the use of higher steam conditions than in this country. Information Bulletin EG(49)1 now issued contains a full account of the equipment and installations inspected.

It was found that the power consumed per ton of coal raised is much higher in Germany and Holland than in this country, partly because of the higher consumption of compressed air both in Holland and Germany. It is regarded as essential that collieries should generate electricity from whatever low-grade fuels they have available, and after they have supplied their own requirements they should sell electricity to the public supply authorities. Because of this the power stations concerned are larger than ours. Power plants and coal preparation plants work in close co-operation and are regarded as a single unit, the power plants consuming middlings and unwashed slurry or dust. Means have been developed for economically burning high ash middlings (up to 40 per cent ash) both as pulverized fuel and on specially developed stokers. In one Dutch station unwashed low volatile slurry is handled and burned efficiently on a Martin stoker. Owing to the size of the stations there is a progressive outlook towards steam conditions and modern pithead plants work with pressures of 900 lb/sq in and over.

Hotpoint washing machines at the Glasgow Service Centre of the S.W. Scotland Electricity Board

India's Electrical Manufacture

In an official summary of India's industrial production last year it is recorded that electric motors totalling 64,057 h.p. were manufactured, compared with 60,000 h.p. in 1948 and electric bulbs numbering 13,500,000 compared with 9,000,000. It states that the most important industrial undertaking started during the year in co-operation with British interests was the telephone cable manufacturing factory at Chittaranjan in Bengal with a capital cost of £750,000. At the same time the telephone industry situated in Mysore made satisfactory progress. The factory began to assemble telephones in April, 1949, its capacity being now 500 a week.

Washing Machine Display

The accompanying picture shows a display of washing machines made by the Hotpoint Electric Appliance Co., Ltd., which is at

present being shown at the Electricity Service Centre of the South West Scotland Electricity Board, Glasgow Sub-Area, in Waterloo Street, Glasgow. The central feature of the display is the Hotpoint washing machine constructed in "Perspex."

Turbo-Alternators for Africa

The Brush Electrical Engineering Co., Ltd., has received an order from the Crown Agents for the Colonies for two 12,500 kW Brush-Ljungström turbo-alternator sets to operate on steam conditions of 400 lb/sq in and 800° F at the turbine stop-valve. The sets, which will be installed in Lagos, were purchased on the recommendation of Preece, Cardew & Rider, Ltd., consulting engineers to the Crown Agents.

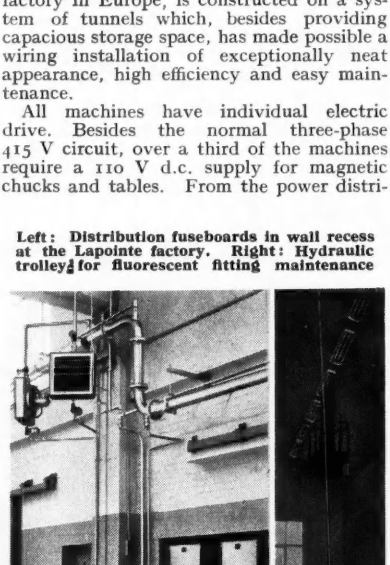
Factory Installation

The benefits of co-operation between architect and electrical contractor are well demonstrated at the new factory which the Lapointe Machine Tool Co., Ltd., has just opened at Bushey on the Watford By-pass. The building, which is the largest broach factory in Europe, is constructed on a system of tunnels which, besides providing capacious storage space, has made possible a wiring installation of exceptionally neat appearance, high efficiency and easy maintenance.

All machines have individual electric drive. Besides the normal three-phase 415 V circuit, over a third of the machines require a 110 V d.c. supply for magnetic chucks and tables. From the power distribution fuseboards, which are recessed in the wall and are fed by underground cables, sheet steel cable ducts are run along the tunnels below the floor with conduit connections to "through the floor" sleeve outlets to the production machines above. A total of 220 floor outlets, spaced at 6ft 6in centres, enables machine lines to be rearranged, or machines added, without major wiring alterations. Floor outlets not in use are fitted with a cap screwed into the socket to form a flush surface. The installed power load is approximately 350 kVA.

For maintenance of the 150 twin lamp G.E.C. fluorescent fittings (each incorporating one "daylight" and one "warm white" lamp) 24ft above floor level in the main machine bay a novel hydraulic trolley device is employed. The five 100 W fittings for the night watchman are contactor controlled from three positions. The electrical contractors for the new building were Barlow & Young, Ltd.

Left: Distribution fuseboards in wall recess at the Lapointe factory. Right: Hydraulic trolley for fluorescent fitting maintenance



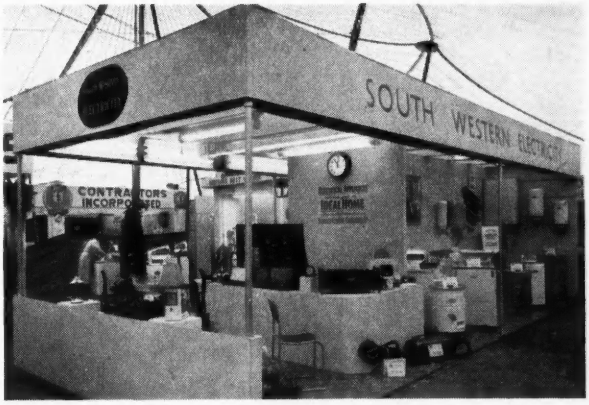
York Explosion Inquest

At the resumed inquest at York last week on Arthur Henry Horwell, aged 48, boiler cleaner, of York, who was killed when a boiler at the Foss Islands power station exploded in the early hours of 27th October, 1949, questions were asked about the chemical action of undistilled water on metal boilers. The explosion wrecked the boiler house, and Horwell's body, buried beneath the debris, was not recovered until seven days afterwards. Mr. A. S. Hollin, power station superintendent, said that the pressure records had been quite normal up to the time of the explosion. The official inquiry into the explosion is being conducted on behalf of the Ministry of Transport by Mr. J. G. Charlton, senior engineer and surveyor, who stated that when he inspected the boiler the day after the explosion he found a crack from the outer row of rivets which stretched for practically the whole length of the drum. In his opinion the evidence suggested that the explosion was due to some form of stress corrosion. A verdict of "Accidental death" was returned by the jury.

Price of Non-Ferrous Metals

Addressing the annual meeting of the British Non-Ferrous Metals Association, Mr. W. H. Henman (president), who has been re-elected to that office for the year 1950-51, referred to the rise in the cost of metals. In the early 'thirties copper went down to £25 per ton and zinc to £9. To-day the price of copper was £186 per ton and zinc was £127 10s. The general changes which had taken place in the value of money accounted for some of the increase, but the

present figures were due, first and foremost, to the fact that the industry was still operating under the wartime system of bulk purchase. It was vital that the prices of copper and zinc, and other non-ferrous metals, should come down to a more reasonable level. Manufacturers in this country were in certain respects at a disadvantage compared with those in other countries who were able to obtain their raw materials at prices more closely in line with the so-called world price. This disparity might well develop into a serious competitive weakness for the exporting industries of Great Britain. The Federation was convinced that the only way to restore sound health to the metal world was to put an end to the present system of bulk purchase by the Government, and to restore free trade in all metals.



The S.W.E.B's display at the recent Plymouth Ideal Homes Exhibition

Scottish Industrial Power Exhibition

The contributions of heavy engineering to the story of British achievement will be demonstrated at the Exhibition of Industrial Power at Kelvin Hall, Glasgow, during the Festival of Britain, 1951. Details of the exhibition were announced by Mr. Tom Johnston, chairman of the Festival of Britain Scottish Committee, on 10th July. In the "power of coal" sequence the subjects covered will be mining, iron and steel, machine tools, power units from Watt to the present day, the generation and transmission of electric power, railways and shipbuilding. In the "power of water" sequence will be hydro-electricity, civil engineering and irrigation. The final section will deal with the source of power of the future—nuclear energy. The exhibition will cover an area of 100,000 sq ft.

Plymouth Ideal Homes Exhibition

The satisfactory sales results achieved by the South Western Electricity Board at the recent Plymouth Ideal Homes Exhibition were evidence of the interest aroused by the Board's exhibit. The stand contained a full range of modern domestic electrical equipment with the appliances grouped in categories and clearly priced to facilitate comparison. The exhibition was the first opportunity which Plymouth citizens had had for many years of seeing under one roof all the up-to-date household apparatus which is now available, and during the fortnight it was visited by about 130,000 persons.

Glasgow Royal Technical College

The new Young Laboratory at the Royal Technical College, Glasgow, was formally opened on 3rd July by Sir William Fraser, chairman of the Anglo-Iranian Oil Co., and a former student of the College. Built in the new extension, the laboratory was given added interest by a display of personal records, notebooks and papers belonging to Dr. James Young, patent holder of the refining process on which ultimate oil refining practice developed. The new laboratory will be used for a number of advanced research projects. Its work will cover silicosis and dust research, infra-red work, high vacuum technology and mass transfer work.

Royal Show Luncheon

Members of the E.D.A. Rural Electrification Advisory Committee and guests lunched together at the Royal Show, Oxford, on Friday last. Mr. H. Nimmo, chairman of the Committee and of the Southern Electricity Board, presided and welcomed the guests. Mr. V. W. Dale, general manager and secretary of E.D.A., proposed the toast of "Agriculture" in felicitous terms and response was made by Mr. Alec Hobson, O.B.E., secretary of the Royal Agricultural Society of England. Mr. Hobson, who modestly disclaimed credit for the success

of the Show in favour of Mr. C. H. R. Naylor, the Society's surveyor, said that there had been no greater development since the last Oxford Show, in the 1870's, than the progress of electricity in farming. He congratulated the Electrical Development Association and the Southern Electricity Board upon the magnificent display for which they were responsible. The farmer needed to know more about electricity, but also some electrical salesmen needed to know more about farming.

Mr. F. E. Rowland proposed a vote of thanks to the chairman to which Mr. Nimmo briefly replied.

Writ Against B.E.A.

It was reported last week that Mr. E. C. Mekie, who was associated with the Edmundsons group of electricity undertakings before nationalization, had issued a writ for libel against the British Electricity Authority and Mr. L. J. Luffingham, the public relations officer. Refusing to comply with the restrictions on political activity Mr. Mekie left the industry in 1948. He is Liberal Unionist candidate for Leith.

Hoover Award

The King, in distributing trophies won at the Royal Norfolk Agricultural Show at Sandringham on 29th June, presented the silver cup for trade exhibits to Hoover, Ltd., whose mobile exhibition was adjudged the best in Show. His Majesty, accompanied by Princess Margaret and the Earl of Leicester, had previously inspected the Hoover exhibition, showing considerable interest in its construction and demonstration facilities.

Retailer's Exhibition

An excellent example of an electrical retailer's enterprise is afforded by an electrical exhibition which was held recently at a local Sunday school at Birkenshaw, Bradford, by Johnson & Co. (Bradford), Ltd., who are electrical dealers and service agents for a number of well-known manufacturers of domestic electrical equipment and radio apparatus. The exhibition, which is the second organized by the company, was held for five days during which it was visited by nearly 5,000 residents with excellent results.

A section of the electrical exhibition recently held by Johnson & Co. (Bradford), Ltd., at Birkenshaw

Welding Research

The annual report of the British Welding Research Association, which has just been published, shows that satisfactory progress has been made during the year 1949-50; there are now 196 ordinary members and 13 associate members. Last year's report suggested that the prospects of purchasing two new machines were not promising, but after an appeal by the chairman members have contributed to the purchase of a large fatigue-testing machine and a pulsating pressure plant for the fatigue testing of pressure vessels. The former has been ordered and the latter has been purchased and installed. These machines will together cost between £15,000 and £20,000 but will provide facilities essential to the proper development of research on welded structures and pressure vessels. Despite crowded conditions good work has been carried out at Abington, but further laboratory space is now essential. Consideration is being given to the erection of a new fatigue-testing laboratory as the first stage of a permanent development scheme.

Operational Research in Industry

The Manchester Joint Research Council, composed of representatives of the Manchester University and Chamber of Commerce, has published "Operational Research: Its Application to Peace-time Industry." The book (price 10s 6d from the Council, c/o Manchester Chamber of Commerce, Ship Canal House, King Street, Manchester, 2) contains the full text of five lectures on the application of operational research to the boot and shoe, coal, cotton and steel industries and road use, together with a re-

port of an open forum. Sir Raymond Street contributes a preface and there is an explanatory article by Professor P. M. S. Blackett, on what operational research means. Photographs and diagrams are included and the book (151 pages) concludes with a bibliography.

Trade Announcements

Zirconal, Ltd., have removed to 25, Clyde Vale, Dartmouth Road, Forest Hill, London, S.E.23.

The Publicity Department of the **Lea Recorder Co., Ltd.,** has been removed to Parliament Mansions, Abbey Orchard Street, Victoria Street, Westminster, London, S.W.1 (telephone: Abbey 4079).

The address of the Leicester branch of the **Skefko Ball Bearing Co., Ltd.,** is now 167, Belgrave Gate, Leicester. The telephone number remains unchanged.

The **Truvox Engineering Co., Ltd.,** announces the appointment of the following sale agents and their respective areas: G. H. Lucas & Co., 57, Princess Street, Manchester, 2 (Lancs (excluding Barrow), Cheshire, Isle of Man, North Wales); D. Whipp, Ltd., 1a, Lenton Avenue, The Park, Nottingham (Notts, Derbyshire, Lincs, excluding the Soke of Peterborough); Mr. R. V. Howell, 24, Budock Terrace, Falmouth, Cornwall (Devon and Cornwall); General Engineering Products, Ltd., 38, Bedford Street, Belfast (Northern Ireland).

Travelling Exhibition

The Caroline Haslett Trust is now inviting applications for a Travelling Exhibition tenable in France, in the early autumn. The successful applicant must possess the diploma in electrical housecraft awarded by the Electrical Association for Women and should have some knowledge of the French language. She will travel in France for two months to study home economics, particularly in the application of electricity to housecraft, and will visit works where domestic electrical equipment is manufactured.

Clock System at the House of Commons

The new House of Commons, now nearing completion, is to be equipped throughout with a controlled clock system made by Gent & Co., Ltd., Leicester. The complete system will comprise a master clock, control panel and 172 insertion type slave clocks of various sizes from 4 in to 20 in diameter. Dials and hand of fretted bronze, with Gothic chapters have been designed by Sir Giles Gibert Scott, to ensure complete harmony with the richly carved panelling and furnishings of the new House.

Annual Holidays

The factories and offices of E. K. Cole, Ltd., at Southend will be closed for the annual works holiday from 28th July to 9th August.

The works of Newman Industries, Ltd., Yate, near Bristol, will be closed for the annual holiday from 28th July to 8th August.

Catalogues and Lists

George H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester.—Priced catalogue of "Wylex" electrical accessories.

B. & H. (Nottm.), Ltd., Popham Street, Nottingham.—Priced catalogue of switch and fuse gear and miscellaneous wiring accessories.

H. J. Thorman Engineering Co., Ltd., 5, Elstree Way, Boreham Wood, Herts.—Catalogue of number wheels and pinions for use in meters and counting devices.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester, 17.—Brochure illustrating the industrial applications of L.D.C. rotating machines, and folder describing the "Crypto" electric hand and face dryer.

Gent & Co., Ltd., Faraday Works, Leicester.—Two catalogues of tower clocks and fire alarm apparatus.

John Davis & Son (Derby), Ltd., All Saints Works, Derby.—Two leaflets describing a compressed air generator and headlamp (24 V 60 W) and the "Dafluor" pneumatic fitting incorporating two 18 in 15 W fluorescent lamps.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Catalogue of industrial selenium rectifier battery chargers.

Seal Conduit Co., Ltd., Cable Street, Wolverhampton.—Price list of conduit fittings in the ductile steels group.

INFORMATION DEPARTMENT

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Jebco" electric kettles.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Electrical Contracting Abroad

Operation of Swedish Incentive Scheme

By J. MORTIMER HAWKINS

HAVING just returned from a visit to Scandinavia, I am particularly anxious to record the information given to me in Sweden on the electrical contractor's status in that country, and the reason for my anxiety will be clear in a few paragraphs. First, let me introduce some of the people I met and describe their various jobs.

I had the pleasure of meeting Mr. Percy Bratt, who is secretary of the Elektriska Installators Organisationernas, the Swedish counterpart of the Electrical Contractors' Association. I also saw Mr. T. Paradis at one of the works of the large and versatile manufacturing organization, A.S.E.A., and enjoyed his generous hospitality.

With Ingeniör Sture Stibler, who is chief engineer of the Installation Department of A.S.E.A. (more of that later), I visited contracting jobs in progress in factory premises and blocks of flats, while one of my last discussions was with Nils Lindgren, an engineer employed by an organization making lighting fixtures.

Although my stay in Sweden was all too brief, my impressions of their electrical industry covered a fairly wide cross-section, as will be seen, and consequently I hope that my information will be of interest and help to our own industry.

Workers Highly Paid

I learned from Mr. Bratt that the electrician is the seventh highest paid worker in Sweden; this arises from two primary reasons, apart from the inherent skills of the job. When wage agreements were first started, over thirty years ago, building processes, by reason of the climate and technical procedures, were limited to seven months of the year. During the other five months the employment of electricians dropped very seriously. Consequently, the rate of pay was then fixed so that in seven months the electrician could earn a year's wages. Since that time building techniques have gradually advanced so that no longer does this condition exist, and electricians have steady employment the year round; but their rate of pay is higher than it would otherwise be because there has been no adjustment in the original figure to allow for the continuous working now possible. This is a factor which is, I think, sometimes overlooked in this country, resulting in a rate of pay which is relatively higher than can always be justified by the skill shown on the job.

The second reason for the high rate of pay in Sweden is the fact that they operate an incentive scheme, not unlike the one which has been prepared in this country by Mr. L. A. Ferney, and described in the *Electrical Review* of 24th February last. Whereas, however, this scheme was pronounced impracticable in this country, the Swedish system has been operating for thirty years. I was surprised to learn that there had not been any official approach to the Swedish organization from this country to see how their incentive scheme worked out.

To crystallize any scheme one needs to know all the details, whereas I can but review in very broad outline some of the principles of operation. As a start, a basic hourly rate is established, which includes a cost-of-living variant and, as in this country, the weekly wage packet is calculated therefrom.

The incentive comes from the pricing of all installation operations in terms of cost, and not in terms of time. For example, if it is known that the average time taken to erect a trough fluorescent fitting is one hour for a man and mate, then it is known that it costs 6s 4d. Now, for a job involving 50 fittings, we in this country talk (hopefully!) about a job taking 50 hours, whereas in Sweden they say positively that the job will cost 50 × 6s 4d, that is, £15 16s 8d. If, by diligence

and attention to work the job is done in 40 hours, the operative still gets £15 16s 8d, but productivity is increased by 20 per cent and wage packets are fatter. That it is possible and practicable to apply this simple principle to the fixing of conduits to floors, walls and ceilings, the fixing and connecting of 4-, 6-, 8- or 10-way fuse boards, and the fixing of the many other components of an electrical installation, is clearly shown by the 250-page Swedish *Ackordsprislistor* which I have in my possession, which has been successfully used for many years. "Ackord," or incentive prices, are adjusted from time to time, as operations are simplified or made more complicated and doubtless these adjustments are somewhat contentious matters, but because of the basic wage rate, no undue heat seems to be generated.

Increased Productivity

Perhaps it is sufficiently indicative to refer to the Working Party Report on the Building Industry, where it is pointed out that whereas in England productivity is down by at least 30 per cent—*to reach pre-war levels it must therefore go up by* 50 *per cent*—productivity in the building industry in Sweden has increased since 1939. In my view this arises from the operation of the incentive approach of employers and by the receptive and co-operative attitude of the trade union.

In this country one feels that experimentation is not encouraged by the unions nor undertaken by employers because of the risk of creating a precedent and causing embarrassment to employers and management—and how can it be otherwise when fear, suspicion and bad faith are more predominant than confidence, trust and good faith?

The highest basic rate of pay in Sweden is approximately 3s 9d per hour (there are four lower grades), but working on incentives, the average earnings for this grade in the industry are 4s 7d. The week is a 48-hour one, made up of five days of 8½ hours and 5½ hours on Saturday—the Swedes, like many other thinking people, know that enough money cannot be earned or the necessary work done by working shorter hours. Overtime, on which there appears to be no restriction from either side, is paid at 35 per cent extra for the first two hours and 75 per cent thereafter; for Sunday and holiday work, 100 per cent. Statutory holidays, such as Christmas, Easter, etc., are not paid for, but the men get fourteen days' paid annual holiday at the basic rate plus the average incentive payment for the previous twelve months.

Of the various operations in electrical contracting work, some 80 per cent are priced on an incentive rate, or "ackord." Estimating is simplified and competition more reasonable, since it is controlled by the estimator's skill in providing for the right quantity of material and method of installation, and the buyer's skill in finding the right markets. This, supported by the diligence of the installing team, gives the customer a good job at a competitive price, a profit to the contractor and a bigger pay packet to the operative.

The incentive scheme is found to work best with teams of men comprising, in terms of grades in this country, a chargehand, an electrician, a mate and an apprentice, working together on the same job, or on different jobs. In this way, the effect of non-incentive repair work is more easily accommodated, and any slackers or incompetents are weeded out by the men themselves. The incentive earned by the team is paid at the end of the job, or if more convenient, every three months on account, and it is allocated in proportion to the hours worked and basic rates of pay.

The rates of pay during the training period of six years are, in my view, rather better graded than in this country. In Stockholm, which is the highest-paid area, the hourly rate for the first year, including a cost-of-living addition, is 1s 9d; for the second year it is 1s 11d; third year, 2s 4d; fourth year, 2s 11d; fifth year, 3s 4d; and sixth year, 3s 9d. These basic rates are, of course, increased by the incentive scheme. I understand that no formal apprenticeships exist, but the intake of trainees in any one firm is controlled by the number of fully qualified men employed by that firm.

Installation Costs

Apart from the increase in productivity, I was given all possible information about the effect of this on the eventual costs. For domestic wiring, the Swedes reckon the electrical installation to cost 3 per cent of the total house costs. This is, I

believe, somewhat less than the figure in this country. It is realized, of course, that this figure depends entirely on the size of the houses or flats, and the concentration of the installation, but since the use of electricity in Sweden is almost exclusive, except in the remote areas, there is no ground for explaining away the difference in costs on this account.

The costs of industrial installations are rather more difficult to compare, except perhaps if attention is confined to a typical factory lighting installation. The kind of buildings I saw were of concrete construction, with the conduits laid in the screed of the floor to feed the ceiling lighting points below. The spacing of the points was approximately 9ft to 10ft apart and no two lighting circuits are allowed in the same tube. Bearing in mind this rather onerous regulation, the fact that the cost of the lighting points amounts in English money to £3 10s a point suggested that in industrial installations also costs are somewhat in favour of Sweden, in spite of the fact that their payments to electricians are considerably higher *because their production is higher.*

In Sweden, which has had a Socialist Government for three decades, neither the national nor the municipal supply undertakings will engage in wiring work. As in all other countries I have visited, generation and distribution are considered to be their proper field of activity.

Insulated Conduit

I found that screwed conduit had been discarded in favour of light-gauge conduit, in many cases with an insulated lining, and continuity and earthing was ensured by including an earth wire in the cabling system in all sections of conduit. In this way, the anxieties which arise in this country over the maintenance of low-resistance earth continuity path via the conduit system are completely eliminated, and I cannot help but feel that there is some merit in this approach which deserves the consideration of our own I.E.E. Wiring Rules Committee. Conduit boxes and accessories were of the lightest and cheapest construction, but none the worse for this because of the earthing and bonding wire.

Distribution in factories, particularly for power supplies, is often in lead cable, sheathed in plastic, which they lay in open cable trays or "ladders" from 6in to 8in wide and suspended from the ceiling some 18in. These trays are fixed along and across the various departments at intervals determined by the density of factory plant. In this way fixings, which otherwise absorb a great deal of labour costs, are reduced, and additions and variations are easier and cheaper than with a screwed conduit installation.

Manufacturers and Contracting

I would like also to refer to the effect of the manufacturing company, A.S.E.A., operating a vigorous installation department. I went very carefully into the reactions caused by this set-up, and must confess that I personally get very little satisfaction from their explanations. Indeed, I feel there is a fundamental criticism of the trade structure in this regard and I feel confident that if such a procedure were attempted in this country the imprudent manufacturer would soon find the error of his ways. Admittedly there are tacit understandings between certain manufacturing companies and contractors which influence business to their mutual advantage; but it is a tendency which needs to be watched very carefully by contractors, particularly as electricity becomes more and more specialized. We already have the internal telephone companies quoting in direct competition with contractors, who ought to be their best customers, and before it is too late we must find out whether it is a good thing for our industry for this kind of procedure to go on.

To conclude, I wish to reiterate the proposal I made last year, to the effect that operative electrical contractors, as distinct from their negotiators, should make arrangements to exchange views with their opposite numbers in other countries—I have been told that such an idea would be welcomed abroad. Perhaps I might ask the direct question whether the Council of the E.C.A. were aware of Sweden's thirty years' practice of those principles which they have recently stated to be impracticable? If they are not aware of Swedish practice, then my suggestion for exchange visits is the more powerful and urgent; whilst if they were aware of it, then they should explain why they think that what is successful in Sweden would fail here.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Refrigerator Accessories

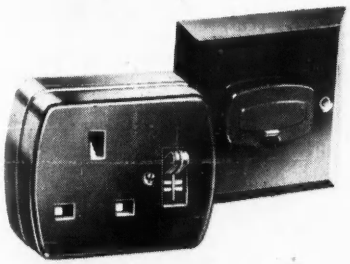
THE job of making ice cubes and frozen dainties is simplified by using the "Puck Flexa" cubes and refrigerator tray made by GROVEWELL, LTD., 656, Forest Road, London, E.17.

The former are individual moulds of non-toxic and odourless plastic material with a sufficient degree of pliability to permit easy ejection of the frozen contents. Two sizes are available; standard, 2in by 1½in by 1⅛in; and cocktail size, 1in by 1½in by 1in. The retail prices are 3s 3d for six (standard size) and 4s 9d for 12 (cocktail size).

The tray which is used in conjunction with these containers will not freeze to the ice chamber. It is mounted on two narrow slides, making only knife-edged contact with the bottom of the ice chamber. It is priced at 3s 3d including purchase tax.

Socket-Outlets

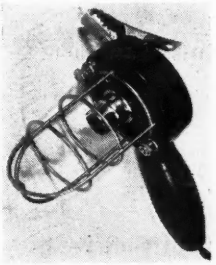
In the latest catalogue to be issued by M.K. ELECTRIC, LTD., Wakefield Street, Edmonton, London, N.18, attention is drawn to the extended range of 13 A "all-purpose" socket-outlets which are primarily intended for ring main circuits. Noteworthy among the new items is a two-gang shuttered socket-outlet assembly which is available in either surface- or flush-mounting patterns. Being interconnected, it is as easy to install as a single socket-outlet. A fused spur box has also been introduced to solve the problem of fusing such apparatus as inset fires and water heaters which are permanently connected to ring main circuits. A further new item is in the form of a 13 A socket-outlet incorporating a switch. This is available for surface mounting, but a similar model can be supplied for flush fixing into any B.S. 1299 standard box.



M.K. Electric surface-mounting 13 A switched socket-outlet (left) and fused spur box (rig. 1)

Car Hand Lamp

A neat hand lamp designed for use on a car battery is now available from PARTRIDGE, WILSON & CO., LTD., Evington Valley Road, Leicester. It takes a pigmy lamp and has a stout wire guard. A crocodile clip enables the lamp to be attached at any convenient position. Both the body and the handle are of rubber. If desired, the lamp can safely be used on the mains. With 12ft of flexible cable the price is 15s.



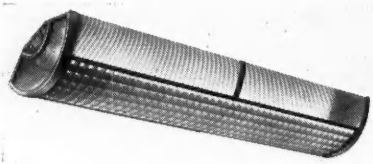
Partridge, Wilson clip-on rubber hand lamp

Automatic Water Boiler

An electrically operated instantaneous water heater, which is now available from JAMES STOTT & CO. (ENGINEERS), LTD., Vernon Works, Oldham, Lancs, with the trade name "Derby," has been designed to meet the needs of small catering establishments and other situations where boiling water is required instantly at widely varying times and long intervals. This machine is entirely automatic, the loading is 3.25 kW and 4.5 gallons of water may be drawn off at any time. The actual heating takes place most frequently in off-peak periods, thereafter giving 24 hours' service on a reserve heat of 250 W. Thus the unit operates economically and at a high overall efficiency.

Store Lighting Unit

HERMAN SMITH, LTD., Reliance Works, Dudley, have produced a new departmental



Herman Smith louvred store lighting fitting

store unit made in either 4ft or 5ft two- or four-lamp sizes. Designed for chain or conduit suspension, it comprises polished cast ends and curved dispersing panels in laminated glass with detachable louvres. The lamp carrier acts as a spine and dispersing reflector, in which the control gear is totally enclosed.

Small Immersion Heater

Comprising a "Pyrex" tumbler and a 460 W element with chrome cover, the "Boilette" will boil small quantities of liquid in under two minutes and is therefore suitable for beverages, egg boiling, sterilizing, etc. It will boil up 65 times for 1 kWh. The unit, which is finished in chromium plate, is supplied by L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, Kingsway, London, W.C.2. The price is 19s 6d complete with flex and tumbler.

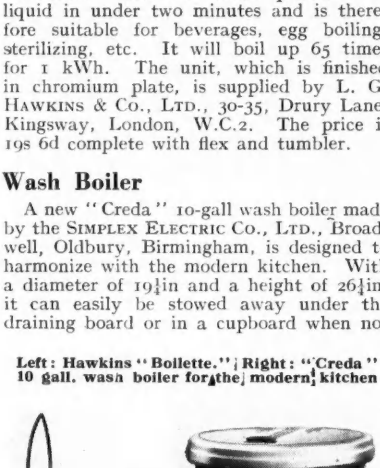
Wash Boiler

A new "Creda" 10-gall wash boiler made by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, is designed to harmonize with the modern kitchen. With a diameter of 19¼in and a height of 26¼in, it can easily be stowed away under the draining board or in a cupboard when not in use, while smooth domes forming the feet under the plinth enable the boiler to be dragged across the floor without difficulty or damage.

Special attention is paid to protection against corrosion. The copper tube has all its joints seamed and the inside is hot tinned. The top edge of the tub rests on the outer case of galvanized steel sheet and is covered by an aluminium rim assembly with a hinged lid which has a "Bakelite" handle. The straight sides, which have no dust or dirt traps, are finished in cream or mottled grey enamel.

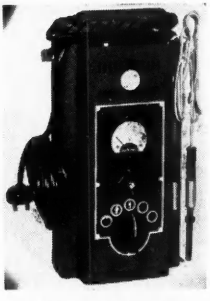
The mica-insulated, metal-sheathed elements have a total loading of 3 kW, two switches giving three heats. Provision is made for fixing a double-pole cut-out to protect the boiler if it is inadvertently left to boil dry. The price is £8 15s.

Left: Hawkins "Boilette." | Right: "Creda" 10 gall. wash boiler for the modern kitchen



Fault Tracing

The location of electrical breakdowns and faults in motor vehicles is easily carried out with the faultfinder, type E.R. 1001, placed on the market by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2. This instrument, which is compact and simple to operate, is designed for use in garages and service depots. Voltages may be checked, capacitances measured, insulation tested and short circuits located. The instrument is housed in a metal case measuring 9in long by 8in wide by 4½in deep and weighs 8¾lb.



Philips faultfinder

Thermal Relays

A new range of thermal delay relays has just been placed on the market by MAGNETIC CONTROLS, LTD., 48, Old Church Street, London, S.W.3, with the trade name "Instanta." These consist of one or other of the company's standard relays fitted with a tapped coil, a set of auxiliary switching contacts and a resistor with a highly negative temperature/resistance co-efficient. Time delay adjustment is provided by selecting suitable values for the coil and delays of from one or two seconds to several minutes can be obtained. These relays are also adaptable to the control of comparatively heavy loads and to multi-circuit switching.

SCOTTISH WATER POWER

Progress of Board's Operations

WITH eight hydro-electric schemes which received Parliamentary approval in 1949, the number promoted by the North of Scotland Hydro-Electric Board is now nineteen. These will provide a total capacity of approximately 630,000 kW, and an annual output of about 1,600 million kWh. Steady progress was maintained during the year on the construction of the Highland grid, and the period also saw a considerable extension of the Board's commercial operations. At the end of the year 11,132 people were employed on the various constructional works. Capital expenditure during the year amounted to £13,410,673, making £32,982,082 altogether.

The Board's report published last week (H.M. Stationery Office, 1s 3d) refers to various factors which have adversely affected its operations. Notably, the Government-imposed cuts in capital expenditure have made it necessary to postpone the start on new hydro-electric schemes—Gaur, Garry, Moriston, Lawers and Glascarnoch-Luichart-Torr Achilty—apart from which the rate of future distribution development has had to be reduced.

Nevertheless, investigations and surveys of further projects have continued, and proposals for schemes to use the waters of Loch Shin, the Rivers Orrin, Giorra, Lyon, Lochay, Lednock, Earn and Oude and the Falls of Mucomir, were prepared by the Board's consulting engineers. The total output and the kilowatt capacity of all schemes —those under construction, those on which work has not begun, and those which have been under survey—are 1,041,750 kW and 3,017.5 million kWh. To counter rising costs of engineering works simplification of schemes not yet started is being considered, and the possibility of introducing new methods of construction is being investigated. In power station design the tendency is now to have one large machine in each station instead of two or more smaller ones.

The number of new consumers connected during the year was 18,797, making a total of 222,174. Supplies of electricity were provided for the first time in 62 villages and hamlets, and 5,529 new electric cookers were connected to the Board's mains. Street lighting was introduced into eighteen villages. Fifty-four small industrial concerns were given supplies for the first time, including new firms engaged in the production of potato crisps, deep freezing of food stuffs, hosiery and tweed. A great volume of distribution development still remains to be carried out, however, much of it in thinly populated rural areas. The difficulty of the task is illustrated by the fact that the Board's area of 21,750 square miles is nearly one-quarter of the area of Great Britain, whereas the population to be served is only 2½ per cent of the total in Great Britain.

An aerial view of the dam at Pitlochry (Tummel-Garry hydro-electric scheme)

Of the 710.2 million kWh generated during the year, 511.2 million were sold in the Board's area.

The Board has encouraged a new industry in Scotland, namely, the manufacture of large water turbines. Plant of this type is now being made for the English Electric Co. at the works of Harland & Wolff, Scotstoun, and for Boving & Co. by John Brown & Co., Clydebank, and by Glenfield & Kennedy at Kilmarnock. In addition, the Harland Engineering Co., of Alloa, has embarked on water turbine manufacture under American licences. Bruce Peebles & Co., Edinburgh, have extended their manufacturing capacity and are now making water wheel generators of substantial capacity, while Harland & Wolff are making large generators as well as

water turbines. In addition, the normal range of Glenfield & Kennedy's hydraulic manufacture has been extended to include drum gates, a modern type of large automatic spill weir. Drum gates have been installed on the dams at Clunie, Pitlochry and Morar. This new industry in Scotland has received orders for 895,540 h.p. of water turbines and 368,400 kW of generators from the Board. A further important result has been that large orders for export have also been brought to Scotland, aggregating about 970,000 h.p. of water turbines and 209,000 kW of generators. Over 15,000 kW of diesel-engine driven generators has been ordered by the Board 80 per cent of the engines and 70 per cent of the generators being manufactured in Scotland.

Experimental work is well advanced in connection with the construction of a special heater to be fired by peat fuel, which will be used in conjunction with an experimental closed cycle gas turbine. This work is being carried out under the general direction of the Board at the works of John Brown & Co., Ltd., Clydebank, and it is hoped that the heater will be ready to function about the end of this year. The 100 kW experimental windmill which is being erected on Costa Hill in Orkney will, it is hoped, also be completed, and ready for running trials by the end of the year.

A profit of £96,815 is shown in the Board's accounts for 1949 (the first full year of operation of the extended area under the 1947 Act). After deducting the accumulated loss of £74,345 brought forward there is a surplus of £22,470.

The report of the Electricity Consultative Council for the North of Scotland District is given in an appendix. A point of interest is that local representation is through the medium of the county councils and five town councils.

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week Mr. Digby asked the Minister of Transport what were the present regulations regarding the height of overhead electricity cables which crossed navigable rivers.

Mr. Barnes said that so far as tidal waters were concerned, section 34 of the Coast Protection Act, 1949, provided that his consent was required to any works, including electricity cables, over any part of the seashore below high water mark of ordinary spring tides if they were likely to cause obstruction or danger to navigation. Since 1922 special Orders made under the Electricity (Supply) Acts also included a section providing that the undertaker should not construct works over the shores of tidal waters without his consent.

In giving his consent it was his practice in such cases to specify a height which would avoid interference with navigation. He was informed by the Minister of Fuel and Power that the Overhead Line Regulations, ELC.53 (1947 Revised) prescribed certain minimum heights for general observance, but not specifically in relation to navigable waters.

Radio Interference

Wing Commander Geoffrey Cooper asked the Postmaster-General what steps he was now taking to encourage the use of equipment for the suppression of radio interference, especially on motor-cars causing interference on television sets.

Mr. Ness Edwards said that close collaboration was maintained with manufacturers in the development of equipment for the suppression of radio interference. As regards motor-cars, a Code of Practice had been prepared giving guidance on the subject.

Replying to Wing Commander Cooper, Mr. Ness Edwards said he would not underestimate the extent of this interference. The Institution of Electrical Engineers had submitted a list of names from which he would appoint a committee to advise him in this matter when he would, if necessary, take action.

Asked by Mr. C. S. Taylor why the fitting of suppressors was not made compulsory, he said that he was giving voluntary methods a complete chance, and, if they failed, then compulsory measures would have to be taken.

Short-Wave Sets

Mr. Reid asked the Secretary of State for the Colonies to what extent cheap short-wave battery wireless receiving sets, made on the initiative of the Northern Rhodesian Government Information Department, had been used in other Colonies by their Governments for diffusion of reliable news in public places.

Mr. Griffiths said that sets had been sent for testing to 13 other territories in which there was considered to be potential use for a short-wave receiver of this type. In Northern Rhodesia more than 2,250 sets had been privately purchased. An interesting report on the use of the set had been published by the Government of Northern Rhodesia.

Television Progress

In the House of Lords on 6th July Lord Brabazon of Tara drew attention to the development, progress and future of television, and moved for papers. He said that the Government should state whether they wanted research or not. We had something good in the 405-line television, but he did not believe it was going to be a permanency. Who was going to develop colour and stereoscopic television? He wondered whether it was right to link television with broadcasting.

Lord Balfour of Inchrye said that by and large we had nothing to be ashamed of in our television achievements. The research and development of television and the capital expenditure involved were beyond the present capacity of the B.B.C., and it would be wrong to tell the taxpayer to carry that load.

Lord Foley said that the staff at Alexandra Palace were working under tremendous technical difficulties. In spite of the fact that the studios were inadequate in size, the results were remarkable. On the question of the 405-lines screen, he said that that was more suitable for coloured television, now the subject of experiments.

In replying for the Government the Earl of Lucan said that the television service was restarted in June, 1946, and at the end of that year there were 7,500 television licences current. In May, 1950, there were 386,000. The industry had contributed by expanding output from an average of 2,000 sets per month in the latter half of 1946 to 17,500 per month in 1949. In the first quarter of 1950 output was 43,000 per month. Research was being given considerable prominence in the B.B.C.'s plans. They were investigating the fundamental principles of colour television and standards of definition as well as such problems as interference from transmitters on the same wavelength. The technical problems of colour television were formidable. It was impossible to predict technical development over the next few years.

In the near future it was hoped there would be some scope for regional variation of programmes with facilities for outside broadcasts in the provinces and ultimately interchange with London. It was doubtful whether an increase in the line standard would result necessarily in better pictures. The disadvantages of going to a higher line standard were principally those of increased cost, both on transmission and receiving. That would inevitably place television beyond the means of a large number of people. Separation of television from sound, and sponsored programmes, were questions before the Beveridge Committee. The B.B.C. had recently been experimenting with long distance outside radio links, and it was possible that it might go to the north coast of France this summer to transmit pictures to England.

The motion was, by leave, withdrawn.

Nationalized Industries

The organization, control and efficiency of the nationalized industries were debated in the House of Lords last week when Lord Lindsay of Birket said he would like the Government to set up a standing advisory board. This board, which ought to include representatives of big industry, could consider any of the problems of the nationalized industries that might be referred to it; for example, the work of the consumer councils.

Lord Swinton thought that the outstanding defect of most of the nationalized industries was over-centralization. The danger of uniformity and stagnation was greatly increased if the central organization imposed a sealed pattern of technical and operational practice, or both, on the regional boards. They would never get custom by making things more difficult and raising prices. He asserted that to divert people to using gas the Government was "damping down" on the production of electric cookers. The consumer was having a pretty raw deal. The nationalized authorities seemed to think they were above criticism. The only solution was to give the area boards real power.

Lord Nathan said that they would not have soundly developed policy if those responsible were looking over their shoulders the whole time. The organization must be allowed to make their mistakes and be given time to settle down.

Lord Piercy thought that unless there was effective representation of consumers fine points of consumers' needs and tastes would be sacrificed.

Replying, Lord Pakenham said that the Government welcomed the debate. Nationalization had brought solid benefits but they were ready to pay attention to any ideas for improving and strengthening the present arrangements. A good deal more remained to be done to make the existence of the consultative machinery a reality to the average consumer.

ELECTRICITY SUPPLY

Zambesi Project

Plans for the North-East

DETAILS of the scheme for building a power station at the Kariba Gorge, on the Zambesi River below the Victoria Falls, were announced last week by Mr. P. H. Haviland, Director of Irrigation, Southern Rhodesia. The cost will be about £30 million, of which about half will be spent on a 400ft-high dam holding 70-90 million acre-ft of water. The continuous power available would be about 600,000 kW and eventually six generating groups would provide about a million kW (peak).

Helicopter Patrols

A trial flight was made in a helicopter by Mr. J. A. Spence, Merseyside and North Wales divisional transmission engineer, on 29th June, to ascertain the flight characteristics of this type of machine with a view to applying it to line patrol, line fault location, carrying emergency gear for repair work in remote districts and general survey of new routes.

Duplicate Line Opposed

West Bromwich Town Council last week decided to oppose "to the utmost extent" a proposal by the British Electricity Authority to erect a second overhead line across the Dartmouth Estate, parallel to the one recently erected to supply a new Smethwick substation. The B.E.A., it was said, maintained that the additional line was essential to safeguard supplies and to carry the ultimate load to be met by the substation at Smethwick. The Council believed that a new line would cause further disfigurement of the estate, acquired at considerable expense for preservation as a "green belt."

Position in North-East

Northern M.P.s have had an interview with Mr. A. Robens, Parliamentary Secretary to the Ministry of Fuel and Power, on the electricity supply position and have been informed that no power cuts should be necessary in the area after 1952. Mr. Robens commented that if the plan for a power station at Kepier (near Durham City) had been allowed to go forward, the present exceptional difficulties in the North East would not have arisen. In place of this scheme it had been decided to extend Dunston power station by 100,000 kW of which 27,000 kW had brought into operation last winter and the remainder would come into use this winter. A new power station at North Tees should be in partial commission in November next year and two new power stations were to be built at Blaydon (Durham) and Blyth (Northumberland). The B.E.A. also proposed to construct a 275 kV super-grid the first part of which would serve the North East Area.

Cables Across River

Axminster Rural District Council has unanimously decided to support a letter sent by the Axe Vale Yacht Club to the South Western Electricity Board making suggestions regarding the cables crossing the River Axe, where two men were recently drowned after receiving an electric shock. Major E. Price declared that the cables had been erected when there was little traffic using the river. He suggested that they should be carried under the water, or taken across at a different place.

Landlords' Sub-Meters

The South Eastern Electricity Consultative Council is asking the Board to investigate the possibility of legislation being introduced to stop landlords having sub-meters set at an unduly high rate. In one case about which a complaint was received the landlord had four sub-meters which he calibrated to his own wishes. The charge was not considered by the Council to be excessive, but it thought that the practice was open to abuse.

Southwick Housing Decision

By seven votes to six Southwick U.D.C. last week referred back a recommendation of the Housing Committee that twelve houses should be provided for key workers at the new power station. Mr. H. H. Smith said that the cost to the ratepayers would be about a 6d or 7d rate.

Worcester Premises Purchased

It is reported that Whittington Hall, Worcester, has been purchased by the Midlands Electricity Board for use as headquarters of the Worcester Sub-Area.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

Walsall Conduits, Ltd.—The full accounts now issued show a consolidated trading profit of £346,508 for 1949, as compared with £372,034 for 1948. The balance from trading account of the parent company is £311,435, as compared with £304,261, to which is added interest of £2,795 and dividend of £15,000 from a subsidiary company, making £329,230. After deducting directors' remuneration and providing £140,884 for taxation, there is a net balance of £153,731 (against £159,658), which with £277,452 brought in makes £431,183 available. General reserve receives £20,000, and the final dividend is 35 per cent, plus a bonus of 15 per cent., again making 70 per cent, less tax, for the year. The balance carried forward is £347,933.

In his statement circulated to shareholders, Mr. A. E. Read (chairman) says that the new tube mill is now in full production. New pickling and enamelling plants are in course of being installed, and it is anticipated these will be completed by the end of the present year. Since 1945 approximately £100,000 has been spent from the company's liquid resources on capital re-equipment and expansion. The continually increasing demand for their products will necessitate further extensions in every department.

Ward & Goldstone, Ltd.—In his review of the past year Mr. A. A. Goldstone (chairman) says that the works are running to capacity. Arrangements have been made to add to the present plant by installing further machinery to increase production and make for greater efficiency in order to meet growing competition both at home and abroad. An associate company, Ward & Goldstone (Ireland), Ltd., has been established in Southern Ireland. In spite of restrictions on imports into many countries it has been possible to rearrange their organization so as to create new opportunities in other markets of the world.

Associated British Engineering, Ltd.—The report and accounts now published show a gross income for the year ended 31st March last of £128,026, as compared with £123,859 for 1948-49. After deducting management expenses, depreciation, etc., and £45,526 for taxation, there is a net profit of £45,699 (against £45,631). It is proposed to pay a final ordinary dividend on increased capital of 10 per cent, making 16 per cent for the year. For the previous year the dividend was 12 per cent in one payment. In addition it is proposed to capitalize £50,000 out of capital reserve and distribute this amount as a capital bonus to ordinary stockholders at the rate of one new ordinary 5s stock unit for each £1 of ordinary stock held.

The Brush Electrical Engineering Co., Ltd.—At an extraordinary general meeting held on 4th July, resolutions were passed for the increase of the authorized capital of the company by £1,170,000 divided into 3,200,000 ordinary shares of 5s each and 370,000 unclassified shares of £1 each, and for the conversion of the ordinary shares of 5s. each, when allotted and fully paid, into ordinary stock.

Hoover, Ltd., has declared an interim ordinary dividend of 15 per cent, less tax (against 10 per cent). The directors state that the increased interim should not be taken as any indication of the total distribution in respect of the year 1950.

E. K. Cole, Ltd., reports a consolidated trading profit for the year ended 31st March last of £287,725, as compared with £266,823 for the preceding eighteen months, and a net profit of £100,681 (against £92,600). The trading profit of the parent company is £296,146 as compared with £271,365 for the previous eighteen months, and the net profit £94,754 (against £85,336). As already announced, it is proposed to pay a final ordinary dividend of 12 per cent, making 20 per cent, less tax, for the year (against 30 per cent for the previous eighteen months).

Telephone Rentals, Ltd., reports group profits for 1949, after all charges, including £170,718 for taxation, of £211,261, as compared with £194,351 for 1948. The amount of profits attributable to members of the holding company is £209,461 (against £193,014). It is proposed to pay a final ordinary dividend of 6 per cent, again making 10 per cent for the year.

Pye, Ltd., reports a group trading profit for the year ended 31st March last, subject to audit, of £494,000, as compared with £313,000 for the previous year, and a net profit of £400,859 (against £268,724). The deferred ordinary dividend for the year is again 25 per cent, but in addition this year it is proposed to pay a dividend of 10 per cent out of a dividend reserve.

NEW COMPANIES

Cripps & Farren, Ltd.—Regd. in Dublin 24th May. Capital £10,000. Electricians, electrical, radio and television engineers, etc. Directors: T. P. Farren and Mrs. Sheila Farren, both of Melrose, Carrigaline Road, Douglas, Co. Cork.

Setchell's Radiovision, Ltd.—Regd. 19th June. Capital £100. Television, radio, electrical, mechanical and domestic engineers and contractors, etc. Directors: C. T. Brown, V. T. Brown and A. A. Tyler. Regd. office: 122, Dalston Lane, E.8.

A. W. Reed & Son, Ltd.—Registered 21st June. Capital £1,500. Manufacturers and repairers of and dealers in dynamos, motors, armatures, etc. Directors: A. W. Reed, C. A. V. Reed and Mrs. F. E. Reed. Reg. office: 59-61, Atlantic Road, S.W.9.

M.A.B. Electrical Services, Ltd.—Registered 22nd June. Capital £200. Electrical and electronic engineers and contractors, etc. Directors: Mrs. Mabel B. Witham and C. Witham. Regd. office: 26, Upper Brook Street, Stockport, Ches.

Q.F. Lighting Co., Ltd.—Registered 22nd June. Capital £1,000. Manufacturers and repairers of and dealers in dynamos, motors, cables, armatures, lamps, fittings, etc. Directors: E. J. Wyborn and Mrs. Mary Wyborn. Regd. office: Western Chambers, Station Approach, Hayes, Mdx.

S.G. (Electrical), Ltd.—Registered 22nd June. Capital £100. Electrical engineers, electrical wiring and installation contractors, dealers in electrical and wireless apparatus, etc. Directors: S. Green and E. G. Allen. Regd. office: Grange Road, Weymouth, Dorset.

R. & G. Radiovision, Ltd.—Registered 26th June. Capital £1,000. Manufacturers and repairers of, agents for, and wholesale and retail dealers in electrical goods of all kinds, wireless sets, etc. Directors: M Revere and E. Greenwood. Regd. office: 120, Stoke Newington Road, N.16.

L.M.B. Instruments, Ltd.—Registered 23rd June. Capital £100. Mechanical, electrical and general engineers, etc. Director: M. P. Bowden. Regd. office: 5a, Old Bedford Row, Luton, Beds.

Coulphone Productions, Ltd.—Registered 1st July. Capital £100. Manufacturers, repairers and distributors of electronic equipment, etc. Subscribers: C. Coulborn and R. T. A. Wills. Regd. office: 53, Burscough Street, Ormskirk.

Miniature Radio Ltd.—Registered 29th June. Capital £7,500. Directors: J. Gulley, R. S. Derry, A. K. Grant and W. J. Saywell. Regd. office: 142, Cheltenham Road, Bristol.

INCREASES OF CAPITAL

Connolly's (Blackley), Ltd.—Increased by £150,000, in £1 ordinary shares, beyond the registered capital of £300,000.

Asea Electric, Ltd. — Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £550,000.

Ega Electric, Ltd.—Increased by £15,000, in 300,000 ordinary shares of 1s, beyond the registered capital of £50,000.

LIQUIDATIONS

C.E.I. (Radio & Television), Ltd.—Members' voluntary liquidation. Particulars of claims by 21st July to the liquidator, Mr. N. R. Oldaker, 133-136, High Holborn, London, W.C.1.

Reliant Radio Service, Ltd.—Meetings 8th August at Adelaide House, King William Street, London E.C.4, to receive an account of the winding-up by the liquidator, Mr. D. R. Clack.

BANKRUPTCIES

G. Wilson, 28, Holmwood Drive, Leicester, formerly carrying on business at 1, Abney Street, Leicester, electrical engineer. —Receiving order made 4th July, on debtor's own petition.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month of 28th June.

MAGNAVOLT. No. 683,914. Class 7. Electric servomotor-operated or servomotor-assisted mechanisms included in Class 7.—English Electric Co., Ltd., Queens House, 28, Kingsway, London, W.C.2.

CHLORIDE. No. 671,733. Class 9. Electric accumulators.—Chloride Electrical Storage Co., Ltd., Exide Works, Clifton Junction, nr. Manchester.

FRANK W. STURGESS (design). No. 680,859. Class 9. Electrical apparatus and instruments included in Class 9; scientific and signalling apparatus and instruments; and wireless sets (complete); and fire-extinguishing apparatus.—W. D. Sturgess, trading as F. W. Sturgess & Son, 2, Seymour Road, Finchley, N.3.

TUFNOL. No. 683,691. Class 9. Parts included in Class 9 of scientific, nautical, surveying and electrical apparatus and instruments (including wireless), measuring, signalling, coin or counter-freed apparatus, talking machines, etc., all being made wholly or partly of plastics.—Tufnol, Ltd., Wellhead Lane Works, Wellhead Lane, Perry Barr, Birmingham, 22B.

MULVARY. No. 686,922. Class 9. Electrical apparatus and instruments included in Class 9.—Mulvary, Ltd., Fluro Works, Knowl Street, Stalybridge, Ches.

SELETRON (design). No. 686,524. Class 9. Electric current rectifiers.—Radio Receptor Co., Inc., Brooklyn, New York, U.S.A. Address for service, c/o C. Lockett Hughes, 46, Bedford Row, London, W.C.1.

METROPAL. No. 686,850. Class 11. Electric lamp bulbs, electric lamps and parts thereof, included in Class 11.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, E.C.4.

FINANCIAL SECTION

STOCKS and SHARES

EVENTS in the Far East overhang Stock Exchange markets and restrain business in all departments. The effect of the crisis is to produce a feeling of caution which, in itself, causes cancellation of buying orders, and a natural hesitancy on the part of capital to seek stocks and shares for employment. People like to keep their money liquid at a time of international trouble, and for this reason the general trend of markets is dull, with losses predominating as compared with the prices of a week ago. The gilt-edged group holds its ground with firmness. The new 3½ per cent British Electricity stock, redeemable 1976-79, is now quoted at 99⅝; this is 12s 6d above the figure at which the stock was issued as recently as the beginning of May. Prices of the other two Electricity stocks are 93¾ for the 1974/77, and 94⅞ for the 1968-73 issues.

Industrial Markets

The latest check to enterprise was doubly disappointing for having caught markets at the point where prices were beginning to respond to an all-round revival of confidence in the business and trading outlook. It is a fair assumption that, if the Korea disturbance can be localized, markets will be found ready to resume business at the point where it was interrupted. Signs of a favourable turn in the sterling-dollar balance of trade were well substantiated by the official figures for the June quarter.

Few Fluctuations

The falls since the end of June are by no means heavy. Anglo-American Telegraph stocks have given way, the preferred 5 points to 95½, the deferred 2 to 16. Oriental Telephone are 2s down at 40s 6d, Globe Telegraph 1s 9d to 44s 6d. British Electric Traction deferred at 425 is 20 points lower. Gains of 6d have made J. Lucas 30s 6d, Hoover 44s 6d, and Henleys 23s. Atlas Electric are better at 15s.

Brush Old and New

Dealings started on Monday of this week in the new shares of the Brush Electrical Engineering Co. The old and new shares are quoted at the same price—5s 3d middle—about 3d per share having been deducted from the old shares as the value of the rights. Two new ordinary shares were given for each £1 ordinary stock, and the 5s per share for the new shares is payable on application, on 28th July.

Pye Dividend

In addition to the 25 per cent dividend, which has been paid annually since 1933, holders of Pye 1s deferred shares are receiving an additional 10 per cent from the dividend reserve. This reserve was created in 1948 out of profits which would, ordinarily, have been distributed but for the dividend limitation agreement. It accumulated in correspondence with amounts paid under the company's employees' profit-sharing scheme. News of the extra distribution had been expected; but the provisional profits statement which accompanied it exceeded best anticipations. The recent rise of 1s in the price of the shares counts in to-day's uneasy markets, as a marked sign of approval. At 35s they yield £3 11s 6d per cent on the dividend alone, and £5 per cent on the total payment. Electric and Musical at 21s 6d, and Decca 13s 6d, are 1s down. Scophony eased off to 1s 6d.

"Ekco" Earnings

Full accounts now published by E. K. Cole confirm that group trading profit for the year ended last March beat comfortably the results of the previous eighteen months' trading. Net profits, less tax and all charges, just exceed £100,000. After payment of dividends on the preference and preferred stocks—the latter participating, as usual, in their extra 3 per cent—the surplus covers about three and a half times the 20 per cent dividend. With the appropriation of £50,000 to reserves, the latter now top the amount of issued capital, and liquidity has been improved. Quotations (and yields) for the three classes of capital are, for the 5½ per cent preference 17s 6d (£6 5s 9d per cent); for the preferred ordinary 23s 9d (£8 8s 6d per cent); and for the 5s ordinary 17s (£5 17s 8d per cent).

London Electric Wire

A moderate line of this company's £1 ordinary shares is available at 47s 6d to yield 4 guineas per cent on one of the most conservative dividends in the electrical lists. From the 1949 group earnings of £319,000 (after the preference dividend), the 10 per cent payment to the ordinary took only £37,600 net. The ploughing back of profits has raised the reserves to 2¾ times the nominal capital; they include a dividend equalization reserve of £150,000. Net liquid assets totalled £2¾ million in the balance sheet published last month. The chairman mentions the possibility of further capital becoming necessary in the not distant future.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1946

13045. Standard Telephones & Cables, Ltd.—Electrical control system. 30th April, 1946. (641881.)

18117. Submarine Signal Co.—Electric follow-up control systems. 17th June, 1946. (641785.)

23123. Cinema-Television, Ltd., and Graham, G. E. G.—Television systems. 2nd July, 1947. (641936.)

24001. Philips Lamps, Ltd.—Lamp-holders. 13th August, 1946. (641883.)

26216. Scientific Acoustics, Ltd., and Clark, F.—Supporting means for electric circuit components. 28th August, 1947. (641884.)

27128. Matthews, S. E. (Soc. Le Carbone-Lorraine).—Electrical contact brushes and methods of producing them. 10th September, 1946. (Convention date not granted.) (641937.)

29669. Bendix Aviation Corporation.—Control systems and devices for dynamo-electric machines. 4th October, 1946. (641787.)

30701. Philips Lamps, Ltd.—Manufacture of electric-discharge tubes. 15th October, 1946. (641788.)

37202. Lubszynski, H. G., and Webley, R. S.—Colour television. 26th November, 1947. (641942.)

37270. Standard Telephones & Cables, Ltd., and Kelly, R.—Electric power supply systems. 12th December, 1947. (641791.)

37271. Standard Telephones & Cables Ltd., and Pease, W. E.—Electric power supply systems. 12th December, 1947. (641792.)

1947

1359. Standard Telephones & Cables, Ltd., and Kelly, R.—Electric power supply systems comprising normal and stand-by sources. 9th January, 1948. (641794.)

3711. Standard Telephones & Cables, Ltd., and Brown, L. R.—Electric signalling systems. 6th February, 1948. (641888.)

4068 & 4070. Ratcliffe, S.—Automatic frequency control of radio-frequency oscillators. 2nd March and 27th February, 1948. (641889/0.)

4069 & 9132. Ratcliffe, S.—Radio-frequency oscillators. 12th and 23rd March, 1948. (641891/2.)

7738. Sperry Gyroscope Co., Inc.—Adjustable phase-shifting devices for high-frequency electrical transmission conduits. 20th March, 1947. (641795.)

8261. General Electric Co., Ltd., and Levy, M. M.—Electric pulse signalling systems. 15th March, 1948. (641982.)

8339. Philips Lamps, Ltd. — Push-pull circuit-arrangements. 27th March. 1947. (641948.)

9168. Cossor, Ltd., A. C., and Wynn, A. H. A.—Television and like receivers. 28th April, 1948. (641949.)

9693. Foster Transformers & Switchgear, Ltd., and Jennings, R. E.—Remote control systems. 9th April, 1948. (641950.)

10106. Philips Lamps, Ltd.—Cathodes for ultra-high-frequency discharge tubes. 16th April, 1947. (641796.)

11651. British Thomson-Houston Co., Ltd., and Clifford, H. S.—Metal-clad electrical switchgear having testing arrangements. 29th October, 1948. (641951.)

12671/2. Metropolitan-Vickers Electrical Co., Ltd., and Robinson, E. Y.—Electric-discharge tubes and holders therefor. 8th June, 1948. (641799/0.)

13789. Philips Lamps, Ltd.—Apparatus for amplifying or generating very-high-frequency electrical oscillations by means of electric-discharge tubes. 22nd May, 1947. (641956.)

15603. Automatic Telephone & Electric Co., Ltd., and Gillett, H.—Mounting plates for electrical components. 13th June, 1947. (641803.)

16639. Brush Development Co. — Moisture-proof piezo-electric crystal and method of making same. 24th June, 1947. (641959.)

16656. Lawarree, H.—Electrolysers having soluble anodes. 24th June, 1947. (641960.)

19137. General Electric Co., Ltd., and Clack, B. N.—Metal vapour electric-discharge devices. 14th July 1948. (641807.)

19276. Standard Telephones & Cables, Ltd.—Radio range beacon. 18th July, 1947. (641809.)

20273. Ratcliffe, S.—Automatic frequency control. 28th July, 1948. (641900.)

21922. Standard Telephones & Cables, Ltd.—System for long-distance radio transmission. 8th August, 1947. (641810.)

22577. Allmanna Svenska Elektriska Akiebolaget. Voltage regulator for alternating-current machines. 14th August, 1947. (641977.)

29728. Standard Telephones & Cables, Ltd.—Telecommunication systems. 7th November, 1947. (641819.)

31454. Chesney, E. St. J.—Current conversion units for wireless apparatus and other services. 24th November, 1948. (Addition to 588317.) (641988.)

34763. British Thomson-Houston Co., Ltd., Veale, R. H., and Roxburgh, A.—High-voltage electric gas-blast circuit-breakers. 22nd December, 1948. (641994.)

1948

1077. Birmingham Small Arms Co., Ltd., Goldschmidt, R., and Wood, A. E. — Mercury electric switches suitable for use on velocipedes. 13th January, 1949. 17th November, 1948. (Cognate applications 29866-9) (641826.)

2374. Dorman & Smith, Ltd., and Lund, J.—Electric fuse-boxes. 28th January, 1949. (641828.)

3244. Chambaut, H. L.—Rotary electric switches. 4th February, 1948. (642040.)

4097. Jelson Electric, Ltd., and Moulson, J. P.—Electric switch and thermal cut-out apparatus. 15th January, 1949. (641913.)

4263. Standard Telephones & Cables, Ltd.—Process for the manufacture of terminal banks. 13th February, 1948. (641914.)

5405 & 5407. Standard Telephones & Cables, Ltd., Starr, A. T., Grayson, H., and Lewin, L.—Electric frequency discriminators. 18th February, 1949. (641915/6.)

5484. Ingersoll-Rand Co.—Reversing mechanism for electric motors. 24th February, 1948. (642006.)

5974. Director of Office of Technical Services, Department of Commerce.—Thermionic valve voltmeter. 27th February, 1948. (642046.)

8057. George & Becker, Ltd., W. & J., and Morris, R. H.—Socketed electrical contacts. 18th March, 1949. (642049.)

8256. Angel Electrical Industries, Ltd., and Izzard, A. E.—Thermostatic electric cut-outs. 24th February, 1949. (641919.)

9587. Bata, Narodni Podnik.—Continuous vulcanization of products or articles in high-frequency electric fields. 6th April, 1948. (641842.)

11755. Ericsson Telephones, Ltd., Drysdale, L. H., and Sharp, D. J.—Automatic telephone systems. 28th April, 1949. (641847.)

13305. Hoover, Ltd.—Electric toasters. 14th May, 1948. (641853.)

(*Continued at foot of next page*)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belfast.—18th August. Electricity Department. Two vertical axial flow circulating water channel pumps. (See this issue.)

Croydon.—20th July. Corporation. Fireproofing electric cables and main control switch in temporary bungalows. (See this issue.)

East Retford.—Corporation. Lighting equipment for trunk road A.1 within the borough. (See this issue.)

Egypt.—25th July. Ministry of Health. Two diesel generating sets for Benha power station. (C.R.E. (I.B.) 58301/50. Ten/1403.)*

Featherstone.—19th July. U.D.C. Duplicate automatic electrically driven pumping sets. Water engineer, Council Offices.

Great Torrington.—22nd July. Town Land Charity. Electrical installation in the Town Hall. S. J. Parkes, steward, 6, Haldon Terrace.

Longbenton.—22nd July. U.D.C. Electrical installations on housing schemes. (See this issue.)

Luton.—22nd July. Corporation. Electrical installations in 422 Council houses. (See 7th July issue.)

New Zealand.—WELLINGTON.—21st November. State Hydro-Electric Department. Two 30,000 kVA synchronous condensers. (C.R.E. (I.B.) 58655/50. Ten/1419.)

3rd October. 10,000 kVA transformer bank. (C.R.E. (I.B.) 58658/50. Ten/1421.)*

NEW PATENTS

(*Concluded from page 82*)

14841. Liverpool Electric Cable Co., Ltd., Frost, J. T., and Cox, J. R.—Electric cables. 2nd June, 1948. (641922.)

17602. Du Pont de Nemours & Co., Ltd., E. I.—Electrodecantation of dilute suspensions. 30th June, 1948. (642025.)

17778. Maschinenfabrik Oerlikon, and Storsand, B.—Electric vehicles. 1st July, 1948. (Addition to 600280.) (641924.)

19493. Bond, H. R. V.—Guard for electric fires. 21st July, 1948. (641868.)

20170. Antrich, J.—Means for supporting the flexible cable of electric irons or like appliances. 27th July, 1949. (642067.)

21280. Brooke, W., and Baldwin, H. T.—Remote control and protection of electric motors. 12th August, 1948. (642071.)

21657. Sharpe, J., Jaques, T. A. J., and Blainey, A.—Neutron detectors. 16th August, 1949. (641926.)

24755. Paillard Soc. Anon.—Rotary electric switches. 22nd September, 1948. (642079.)

30299. General Electric Co., Ltd., Parker, E. L., and Reeves, F. M.—Electrical contact members. 8th November, 1949. (641929.)

30675. Jelson Electric, Ltd., and Moulson, J. P.—Quick-make-and-break electric switches. 16th December, 1948. (Divided out of 641913.) (641930.)

Romford.—31st July. Corporation. Electrical installation in a public convenience. (See this issue.)

South Africa.—5th August. Worcester Municipal Electricity Department. E.h.v. switchgear and ancillary equipment. (C.R.E. (I.B.) 58125/50. Ten/1404.)*

Sunderland.—4th August. Corporation. Electrical installation at Bede Tower. (See 7th July issue.)

Uganda.—31st July. L.v. cable installation for the Tororo Cement Works. (See 7th July issue.)

Uruguay.—9th August. Usinas Electricas y Telefonos del Estado. Supply of single rate meters. (C.R.E. (I.B.) 57616/50. Ten/1386.)*

14th August. Telephonic carrier current equipment. (C.R.E. (I.B.) 57617/50. Ten/1389.)*

Wiltshire.—County Education Committee. Electrical installation in proposed infants' school, Bemerton Heath, Salisbury. (See this issue.)

ORDERS PLACED

Sheffield.—Corporation Housing Committee. Electrical installations in 85 terrace houses and 116 old people's dwellings on the Manor Park, Littledale and Richmond estates (£3,623).—M. J. Gleeson.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Halls of residence for University of Wales; Sir Percy Thomas & Son, architects, 10, Cathedral Road, Cardiff.

Abingdon.—School for Berkshire E.C.; Bridgwater & Shepherd, architects, 42, Brutton Place, W.1.

Amble.—Houses north of the Lord Mayor's Holiday Camp for the U.D.C.; A. W. Charity, surveyor.

Ashton-under-Lyne.—Houses and flats (72) and 15 shops at Crowhill estate; borough surveyor.

Junior school for Lancs E.C.; J. Ridyard & Sons, Ltd., Ashton.

Atherton.—Houses (46) and a block of flats; U.D.C. surveyor.

Barnsley.—Houses (72), Athersley estate; borough engineer.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Beeston & Stapleford.—Shopping centre, Ingham Nook housing site, Chilwell, for Beeston & Stapleford U.D.C.; C. H. Wragg, clerk, Town Hall, Beeston, Notts.

Birmingham.—Proposed museum (£80,000); city engineer, Civic Centre.

Civic restaurants, Birchfield Road, Perry Bar and Gooch Street, Balsall Heath; city engineer.

Bolton.—Houses (120), Padbury Way, Top O'th Brow; housing director.

Bristol.—Health centre, Leinster Avenue, Knowle; J. B. Bennett, city engineer, Bath Road, Brislington, Bristol, 4.

Cannock.—Houses (44), Brewood and Featherstone; J. P. Roberts, clerk to R.D.C., Council Offices, Penkridge, Stafford.

Chesterfield.—Houses at Newbold estate; W. Revill & Sons, Ltd., 155, Boythorpe Road, Chesterfield (80), W. H. Frearson, Chesterfield (12), and W. Drabble & Sons, Mosborough, Eckington, near Chesterfield (52).

Crawley.—Dwellings (96), in nine blocks of three-storied flats, West Green site 3B, for Development Corporation; chief architect, Broadfield, Crawley, Sussex.

Croydon.—Maisonettes (80), New Addington estate; S. A. Gregory, Ltd., builders, 27, Chapel Road, Worthing.

Derbyshire.—Proposed junior and infants' school at Ripley; county architect, Derby.

Exeter.—Houses (58), Countess Wear estate; Selleck, Nicholls & Co., Ltd., East Hill, St. Austell.

Falkirk.—In the note in our 16th June issue relating to the construction of a nurses' home the address of the North-East Regional Hospital Board was given in error instead of the Western Regional Hospital Board, 64, West Regent Street, Glasgow. The architects for the work are Wilson & Wilson, 39, Vicar Street, Falkirk.

Feltham.—Terminal building for London Airport; Frederick Gibberd, architect, 35, Gordon Square, W.C.1.

Gloucester.—Nurses' home at City General Hospital; South-Western Regional Hospital Board, 11, Upper Belgrave Road, Bristol.

Great Yarmouth.—Houses (160), Magdalen College estate, Gorleston, and six police houses, Marine Parade North; F. Conway, town clerk, Town Hall.

Halesowen.—Flats (18) at Hasbury Farm estate; Shaw Bros., Cradley.

Hebburn-on-Tyne.—Houses (62), Hartleyburn site, for the U.D.C.; W. Leech, Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne.

Hounslow.—New school (to replace Town primary school) for Middlesex C.C. (£90,645); county architect.

Huddersfield.—Erection of Rawthorpe secondary school; A. Brett (Contractors), Ltd., Preston.

Hull.—Redevelopment of blitzed site bounded by Waterworks Street, Chapel Street and Jameson Street, for shops, stores, etc.; Ravenseft Properties, Ltd., London.

Hyde.—Extensions to Redferns Rubber Works; chief engineer.

Ilford.—Flats (83) in seven blocks, Cranbrook Road; borough engineer.

Jarrow-on-Tyne.—Factory for Lamb's Potato Crisps, Ltd., Frederick Street, Sunderland.

Factory extension for Morganite Resistors, Ltd., Bede estate; Spence and Price, architects, St. Mary's Place, Newcastle-on-Tyne.

Kearsley.—Cottage flats (24) at Singing Clough site; C. Musker Bros., Ltd., Bingham Street, Swinton.

Keighley.—Housing estate at Ribblesden; Ernest Salter, Ltd., builders, Oakworth Road.

Leeds.—Factory, Kirkstall Road; Wetherall, Ltd., 147, Park Lane.

Liverpool.—Out-patients' department at Victoria Central Hospital, Wallasey, for Regional Hospital Board; Rees & Holt, architects, 64, Rodney Street, Liverpool.

Housing scheme for Croxteth, including schools, nurseries, public offices, etc. (first layout is for 919 houses and 332 flats); city engineer, Municipal Buildings, Dale Street.

Loftus.—Houses (46) at Liverton Mines; U.D.C. surveyor.

London.—CHELSEA.—Shops and 24 maisonettes, King's Road; Armstrong & MacManus, architects, 19, Manchester Square, W.1.

POPLAR.—Factory etc., Waterden Road; Clarke, Nicholls & Coombs, Ltd., Wallis Road, E.9.

Manchester.—Extensions at Withington Hospital; Moston Brick & Building Co., Ltd., Collyhurst, Manchester.

Proposed Y.M.C.A. residential hostel; S. Fairhurst & Sons, architects, 55, Brown Street, Manchester.

Middlesbrough.—House on the Saltersgill site for the T.C.; builders (all local firms): Whitehead and Son (20 houses); A. and R. Cubitt (26); and E. T. Sweeting and Son (22).

Houses (12), Parkfield Avenue; Egerton Price, builder, Cowley Road.

Skipton.—Seven blocks of "Gregory" flats; T. Yeadon, R.D.C. surveyor.

Staffs.—Conversion of Kniveden Hall, Leek, as hostel for aged (£20,000) and erection of residential nursery at Rowley Park, for C.C.; C. M. Coombs, county architect, Stafford.

Sunderland.—Houses (1,400) at Farrington Hall; borough architect, Stockton Road.

Surrey.—Schools, Leatherhead (£109,655), Stoke Hill, Guildford (£46,450), and Tudor Drive, Merton & Morden (£41,797); county architect, Kingston-on-Thames.

Thetford.—Conversions, etc., at Tannery House, for local health offices; county architect, 27, Thorpe Road, Norwich.

Todmorden.—Houses and flats at Standfield Mill site; borough surveyor.

Tottenham.—Block of 67 flats, Tewkesbury estate; Howes & Jackman, architects, 1, Verulam Buildings, Gray's Inn, W.C.1.

Wakefield.—Houses (100), in pairs, Eastmoor estate; city engineer, Room 33, Town Hall.

Warrington.—Maisonettes (32), Capesthorne Road; borough engineer.

Worksop.—Houses (32), Le Brun Square, for R.D.C.; Dernie & Bell, 17, Mount Avenue.

Wrexham.—Flats (32), Little Acton; borough engineer.

York.—Block of flats, Castlegate; Robert Atkinson, 19, Manchester Square, W.1.